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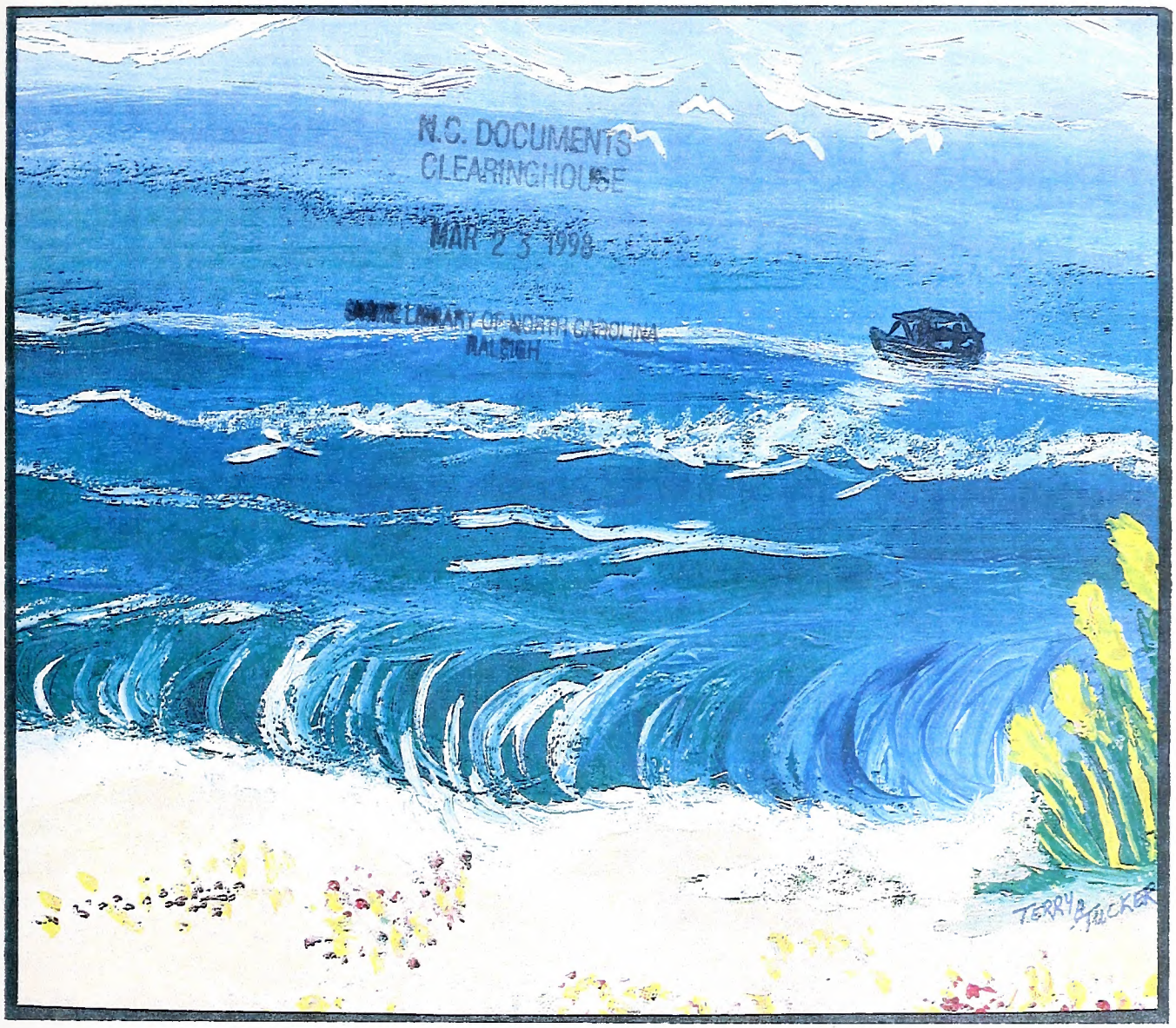
North Carolina Department of Transportation
Division of Highways
Statewide Planning Branch

THOROUGHFARE PLAN STUDY TECHNICAL REPORT FOR PENDER COUNTY



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THOROUGHFARE PLAN REPORT

FOR

PENDER COUNTY, NORTH CAROLINA

Prepared by the:

Statewide Planning Branch
Division of Highways
N. C. Department of Transportation

In cooperation with:

The County of Pender
The Federal Highway Administration
U. S. Department of Transportation

1998

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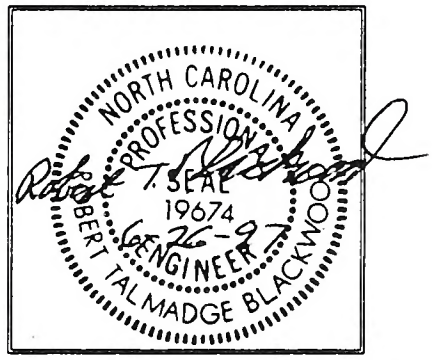

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1. INTRODUCTION

A well planned transportation system is an asset to the economic and social well being of a growing community. It provides the means to transport people and goods from one place to another quickly and conveniently. A good system must not only meet existing travel demands, but must also keep pace with the development of the region. This report will set a system of major roads and highways required to satisfy the anticipated needs of Pender County for the next twenty five years. Certain priorities shall be established in the development of the thoroughfare system. These priorities will be based on maintenance needs, bridge inadequacies, poor alignments, and insufficient present and future roadway capacities.

The proposed Pender County Thoroughfare Plan was developed following the basic principles of thoroughfare planning as described in Chapter 3 of this report. The plan recommends those improvements that are felt to be essential for proper traffic circulation within the 1995-2020 planning period.

Most of the proposed improvements will be the responsibility of the North Carolina Department of Transportation. However, Pender County can provide assistance in the implementation of the plan through subdivision regulations and zoning ordinances. It will be desirable for the plan to be formally adopted by both the County Commissioners and the North Carolina Department of Transportation to serve as a official guide in providing a well coordinated, adequate, and economical major thoroughfare system.

2. THOROUGHFARE PLAN

A thoroughfare plan study uncovers the need for new facilities, plus identifies existing and future deficiencies in the transportation system. The planning methodology enables identification of deficiencies in the existing system, allowing compilation of a list of needed improvements.

This chapter presents an analysis and makes recommendations based on the ability of the existing street system to serve present and future travel desires as the area continues to grow. The usefulness of transportation planning is in the analysis of different highway configurations for their efficiency in serving the area. The recommended plan sets forth a system of thoroughfares to serve the anticipated traffic and land development needs for the Pender County area. Eliminating existing and projected system deficiencies that cause traffic congestion is the primary objective of the plan.

The thoroughfare plan outlines the transportation system network according to each roadway's function within the system. Each road in the thoroughfare plan was evaluated based on the following factors: alignment, capacity, width, number of lanes, projected 2020 traffic volume, existing and future land use patterns, and environmental impacts. Suggestions for the improvement of roads are made based on these factors. Also, aerial photography, topographic mapping, field reconnaissance, and discussions with local staff, officials, and local citizens provided additional basis for identifying and evaluating alternate alignments.

The recommended thoroughfare plan for Pender County is shown in figure **2-A** and detailed in Appendix A. Elements of the plan are classified as urban or rural. The area around Burgaw is delineated as an urban thoroughfare planning area since a mutually approved thoroughfare plan exists between NCDOT and the Municipality.

Only major thoroughfares classified as to either existing or proposed are shown within the urban thoroughfare planning area in figure **2-A**. This was necessary due to the limited amount of detail that can be shown on the county level.

See Chapter 3 of this report for definitions and descriptions of the street classifications.

Elements of the Pender County Plan are as follows:

Interstates

I-40

Suggestions for Interstates

I-40 - Since the projected traffic on I-40 through Pender County is less than the capacity, no suggestions are made for I-40 in this report.

Principal Arterials

US 17

Suggestions for Principal Arterials

US 17 - A multi-lane section is recommended for US 17 from New Hanover County to Onslow County. A four lane divided cross section is suggested for rural areas, with a five lane curb and gutter section utilized in developed areas due to high turning traffic. This project, R-2405, appears in the 1998-2004 Transportation Improvement Program (TIP) as part under construction. Considerations should be made to accommodate bicycle traffic where appropriate.

US 17 Bypass - A bypass of Hampstead is also recommended. The project, R-3300 is included in the 1998-2004 TIP as programed for Planning and Environmental study.

Minor Arterials

US 421

Suggestions for Minor Arterials

US 421 - Current cross-section is adequate.

Collector Road System

Major Collectors:

US 117
NC 11
NC 50
NC 53
NC 210

Suggestions For Major Collectors

US 117 - Duplin County to SR 1318. The current cross section should be adequate, however, turn lanes would be very beneficial at NC 11 and SR 1314. From Burgaw's southern planning limit to New Hanover County. This section should be widened to a multi-lane section. A four lane divided cross section is suggested for rural areas, with a five lane curb and gutter section utilized in developed areas due to high turning traffic.

NC 11 - Current cross section should be adequate.

NC 50 - From Duplin County to NC 210. This section should be widened to 22 feet to meet minimum lane width standards. Ultimately, NC 50 will need to be multilaned from NC 53 to NC 210. This also includes a replacement of the bridge south of NC 210.

NC 53 - From Ward's Corner to Onslow County. This section should be widened to 24 feet to meet minimum lane width standards. Ultimately, NC 53 will need to be multilaned from I-40 to NC 50.

NC 53 Bypass - From NC 53 west of I-40 to NC 53 at SR 1340 (New Savannah Road). This project consists of a two lane 24 foot wide cross section with 100 feet of Right of Way. Most of the project is on new location.

NC 210 - From Bladen County to US 17. This section should be widened to 24 feet to meet minimum lane width requirements. Considerations should be made to accommodate bicycle traffic where appropriate.

Minor Collectors:

NC 133	
SR 1001	Willard Road
SR 1002	Island Creek Road
SR 1120	Malpass Corner Road
SR 1121	Bell-Williams Road
SR 1128	Point Caswell Road
SR 1201	Beatty's Bridge Road
SR 1209	Shiloh Road
SR 1216	Piney Woods Road
SR 1305	Doctors Creek Road
SR 1332	Penderlea Highway
SR 1336	Horse Branch Road
SR 1347	Old Savannah Road
SR 1400	Highsmith Road
SR 1533	Shepards Road

Suggestions for Minor Collectors

NC 133 - From SR 1409 to US 117. A 24 foot lane width is recommended for this section.

SR 1001 (Willard Road) - From Sampson County to US 117. This section should be widened to 20 feet to meet minimum lane width requirements.

SR 1120 (Malpass Corner Road) - From SR 1121 to Burgaw's western planning limit. This section should be widened to 22 feet to meet minimum lane width requirements.

SR 1121 (Bell-Williams Road) - From NC 11 to Yamacraw. This section should be widened to 20 feet to meet minimum lane width requirements.

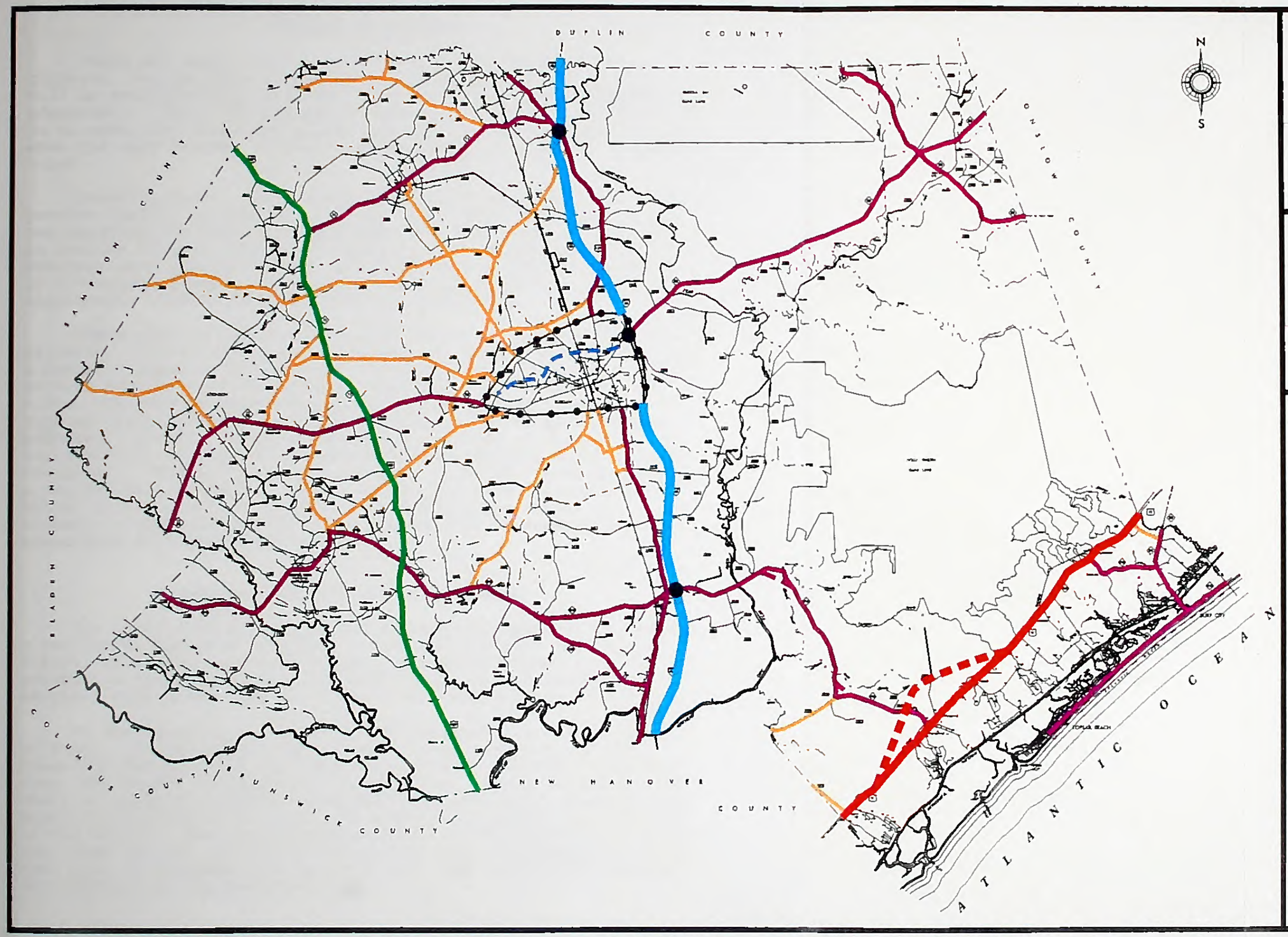
SR 1128 (Point Caswell Road) - From NC 11 to Murphy Cross Roads. This section should be widened to 20 feet to meet minimum lane width requirements.

SR 1201 (Beatty's Bridge Road) - From Bladen County to Atkinson. This section should be widened to 20 feet to meet minimum lane width requirements.

SR 1209 (Shiloh Road) - From Sampson County to SR 1332. This section should be widened to 20 feet to meet minimum lane width requirements.

SR 1216 (Piney Woods Road) - From SR 1128 to Burgaw's western planning limit. This section should be widened to 20 feet to meet minimum lane width requirements.

SR 1336 (Horse Branch Road) - A realignment of SR 1336 at the intersection with SR 1315 (Old Anderson Street) is recommended. This intersection provides little sight distance currently. Part of the alignment would utilize the old railroad bed. The other lot affected is vacant.



LEGEND

	EXISTING	PROPOSED
INTERSTATES		
OTHER PRINCIPAL ARTERIAL		
MINOR ARTERIAL		
MAJOR COLLECTOR		
MINOR COLLECTOR		
URBAN MAJOR		
INTERCHANGE		
URBAN PLANNING AREA BOUNDARY		

ADOPTED BY:

PENDER COUNTY 6-2-97

PUBLIC HEARINGS 6-2-97

RECOMMENDED APPROVAL BY STATEWIDE PLANNING BRANCH M.R. Robb 8-15-97

NORTH CAROLINA DEPARTMENT OF TRANSPORTATION 9-5-97

FIGURE 2 - A

JUNE 2, 1997

THOROUGHFARE PLAN FOR PENDER COUNTY NORTH CAROLINA

PREPARED BY THE

NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
DIVISION OF HIGHWAYS - STATEWIDE PLANNING

IN COOPERATION WITH THE

U.S. DEPARTMENT OF TRANSPORTATION
FEDERAL HIGHWAY ADMINISTRATION

1 0 1 2 3 4 5 6 7
miles

0 1 2 3 6 9 12
kilometers

BASE MAP DATE
MAY 30, 1997

3. COUNTY THOROUGHFARE PLANNING PRINCIPLES

Purpose of Planning

There are many benefits to be gained from thoroughfare planning, but the main objective is to assure that the road system will be progressively developed to serve future travel desires adequately. Thus, the main consideration in thoroughfare planning is to make provisions for street and highway improvements so that, when the need arises, feasible opportunities to make improvements exist.

Streets, roads, and highways have two primary functions: they provide traffic service and land service. When combined, these two services are basically incompatible. This conflict will not be serious if both traffic and land service demands are low. However, when traffic volumes are high, excess conflicts created by uncontrolled and intensely used abutting property result in intolerable traffic flow friction and congestion.

There are two major benefits derived from thoroughfare planning. First, each road or highway can be designed to perform a specific function and provide a specific level of service. This permits savings in right-of-way, construction, and maintenance costs. It also protects residential neighborhoods from cut-through traffic and encourages stability in travel and land use patterns. Second, local officials are informed of future improvements and can incorporate them into planning and policy decisions. This will permit developers to design subdivisions in a non-conflicting manner, direct school and park officials to better locate their facilities, and minimize the damage to property values and community appearance that is sometimes associated with road improvements.

County Thoroughfare Planning Concept

The underlying concept of the thoroughfare plan is to provide a functional system of streets, roads, and highways that permit direct, efficient, and safe travel. Different elements in the system are designed to have specific functions and levels of service, thus minimizing the traffic and land service conflict.

In the county plan, elements are designated as either urban or rural. In the urban planning area, the local municipality generally has planning jurisdiction. Outside the urban planning area, the county has planning jurisdiction. In those urban areas where no urban thoroughfare plan has been developed, elements are generally designated as rural and under the planning jurisdiction of the county. When a thoroughfare plan is developed for an urban area that has not previously had a plan, then the area defined by that plan is considered to be urban and comes under the planning jurisdiction of the municipality.

Within the urban and rural systems, thoroughfare plan elements are classified according to the specific function they are to perform. A discussion of the elements and functions of the two systems follows.

Urban Thoroughfare Classification System

In the urban thoroughfare plan, elements are classified as major thoroughfares, minor thoroughfares, or local access streets. The major thoroughfares are the primary traffic arteries of the urban area providing for traffic movements within, around, and through the area. Minor thoroughfares are designed to collect traffic from the local access streets and carry it to the major thoroughfare system. Local access streets, which may be further classified as residential, commercial, or industrial streets, are designed only to provide access to abutting property. Due to the limited amount of detail that can be shown on a county thoroughfare plan, only urban major thoroughfares are shown.

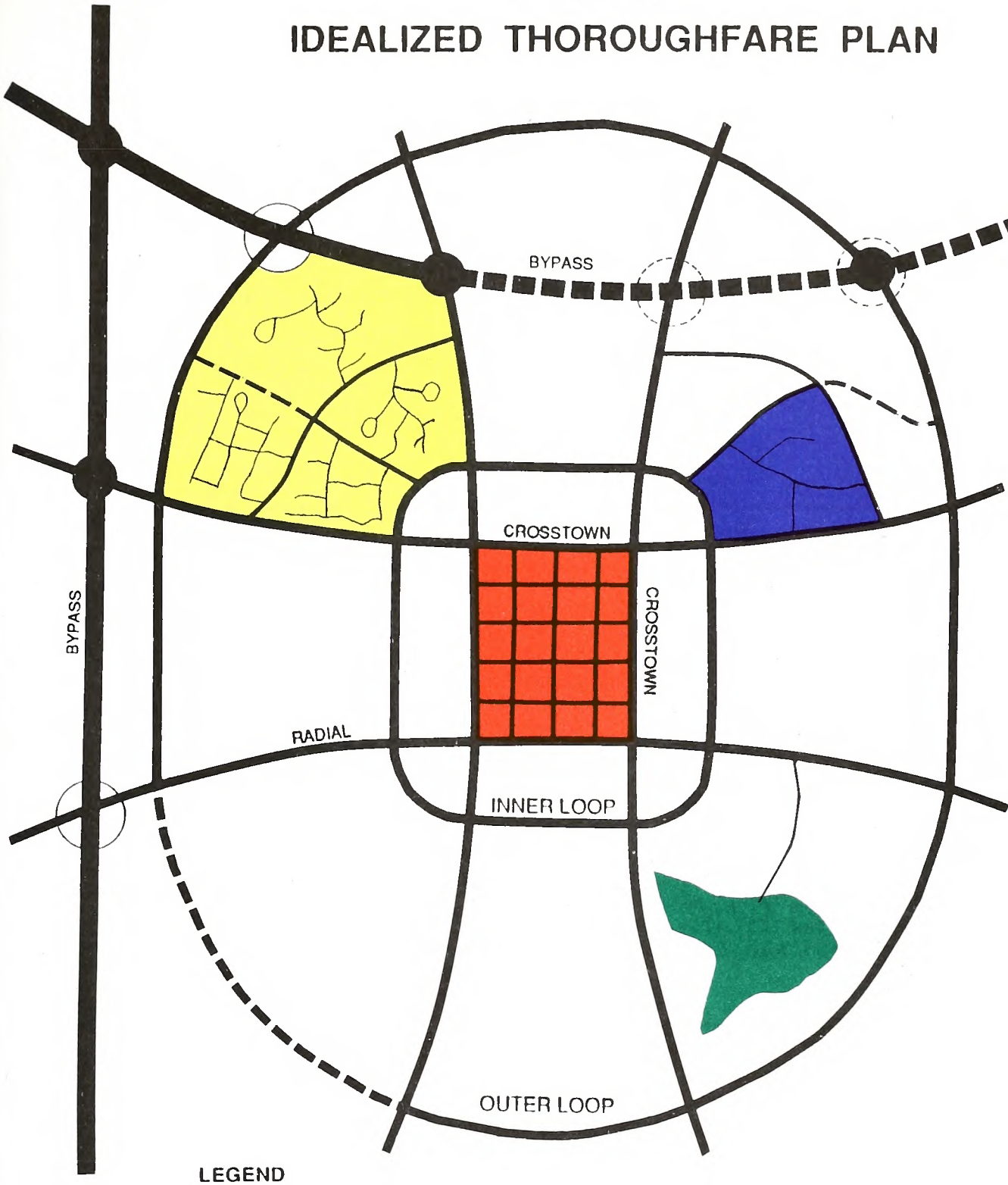
The coordinated system of major thoroughfares that is most adaptable to the desired lines of travel within an urban area and which is reflected in most urban area thoroughfare plans is the radial-loop system. The radial-loop system includes radials, cross-towns, loops, and bypasses. Radial thoroughfares provide for travel from points outside to major destinations inside the urban area. Cross-town thoroughfares provide for traffic movement across the central area and around the central business district (CBD). Loop thoroughfares provide for lateral travel movements between suburban areas. Bypasses are designed to carry non-local traffic around and through the area. Occasionally, a bypass with low through traffic volumes can be designed to function as a portion of the urban loop. **Figure 3-A** illustrates the concepts of the radial-loop major thoroughfare system and the functionally classified urban street system.

Rural Thoroughfare Classification System

The rural system consists of those facilities outside the urban thoroughfare planning boundaries. They are classified into four major systems: principal arterials, minor arterials, major and minor collectors, and local roads. **Table 3-1** indicates generally accepted statewide mileage on these systems.

FIGURE 3-A

IDEALIZED THOROUGHFARE PLAN



LEGEND

	EXISTING	PROPOSED
MAJOR THOROUGHFARE FREEWAY		
MAJOR OTHER		
MINOR THOROUGHFARE		
LOCAL ROAD		
INTERCHANGE		
GRADE SEPERATION		

LAND USES

- COMMERCIAL/BUSINESS
- RESIDENTIAL
- INDUSTRIAL
- PUBLIC/INSTITUTIONAL

TABLE 1	
Rural System Road Mileage Distribution	
Systems	Percentage of Total Rural Miles
Principal Arterial System	2-4
Principal Arterial System plus Minor Arterial Road System	6-12
Collector (Major and Minor) Road System	20-25
Local Road System	65-75

Rural Principal Arterial System: This system consists of a connected network of continuous routes that serve corridor movements having substantial statewide or interstate travel characteristics. This will be indicated by both the trip lengths and the travel densities. The principal arterial system should serve all urban areas of over 50,000 population and a majority of those with a population greater than 5,000. The Interstate system constitutes a significant portion of the principal arterial system.

Rural Minor Arterial System: This system, in conjunction with the principal arterial system, forms a network that links cities, larger towns, and other major traffic generators such as large resorts. The minor arterial system generally serves intra-state and inter-county travel and travel corridors with trip lengths and travel densities somewhat less than the principal arterial system.

Rural Collector Road System: The rural collector routes generally serve intra-county travel rather than statewide travel. This system consists of those routes on which the predominant travel distances are shorter than on the arterial routes. The rural collector road system is subclassified into major and minor collector roads.

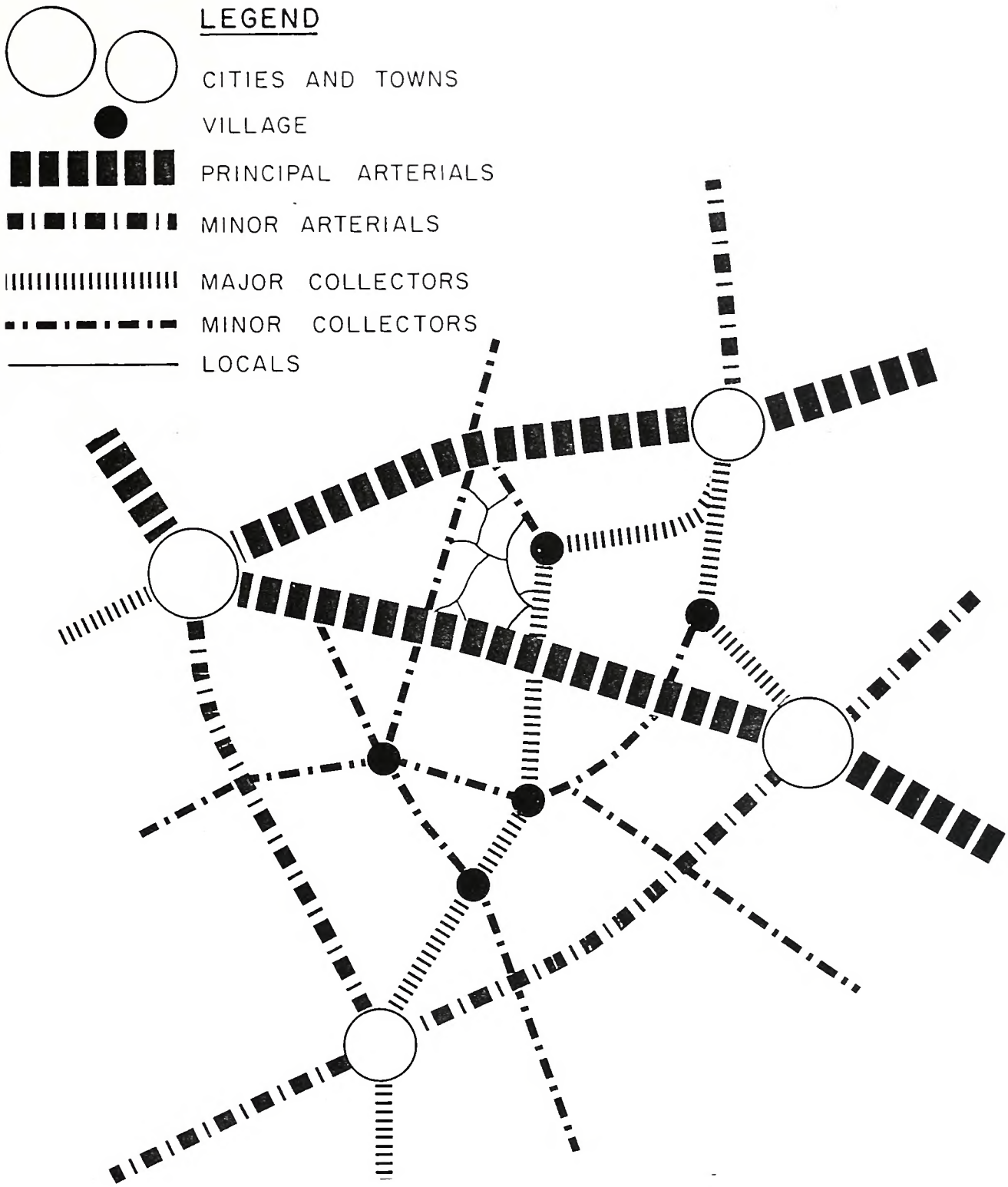
Major Collector Roads: These routes provide service to the larger towns not directly served by the higher systems and to other traffic generators of equivalent intra-county importance, such as consolidated schools, shipping points, county parks, significant mining and agricultural areas, etc. Major collector roads also link these places to routes of higher classification and serve the more important intra-county travel corridors.

Minor Collector Roads: These routes collect traffic from local roads and bring all developed areas within a reasonable distance of a major collector road; provide service to the remaining smaller communities; and link the locally important traffic generators with the rural outskirts.

Rural Local Road System: The local roads are comprised of all roads that are not on a higher system. Local residential subdivision streets and residential collector streets are elements of the local road system. Local residential streets are either cul-de-sacs, loop streets less than 2,500 feet in length, or streets less than one mile in length that do not connect thoroughfares or serve major traffic generators and do not collect traffic from more than one hundred dwelling units. Residential collector streets serve as the connecting street system between local residential streets and the thoroughfare system.

Figure 3-B gives a schematic illustration of a functionally classified rural highway system. **Figure 3-C** shows the functional classification of the major roads in Pender County.

FIGURE 3-B



SCHEMATIC ILLUSTRATION
OF FUNCTIONALLY CLASSIFIED
RURAL HIGHWAY NETWORK

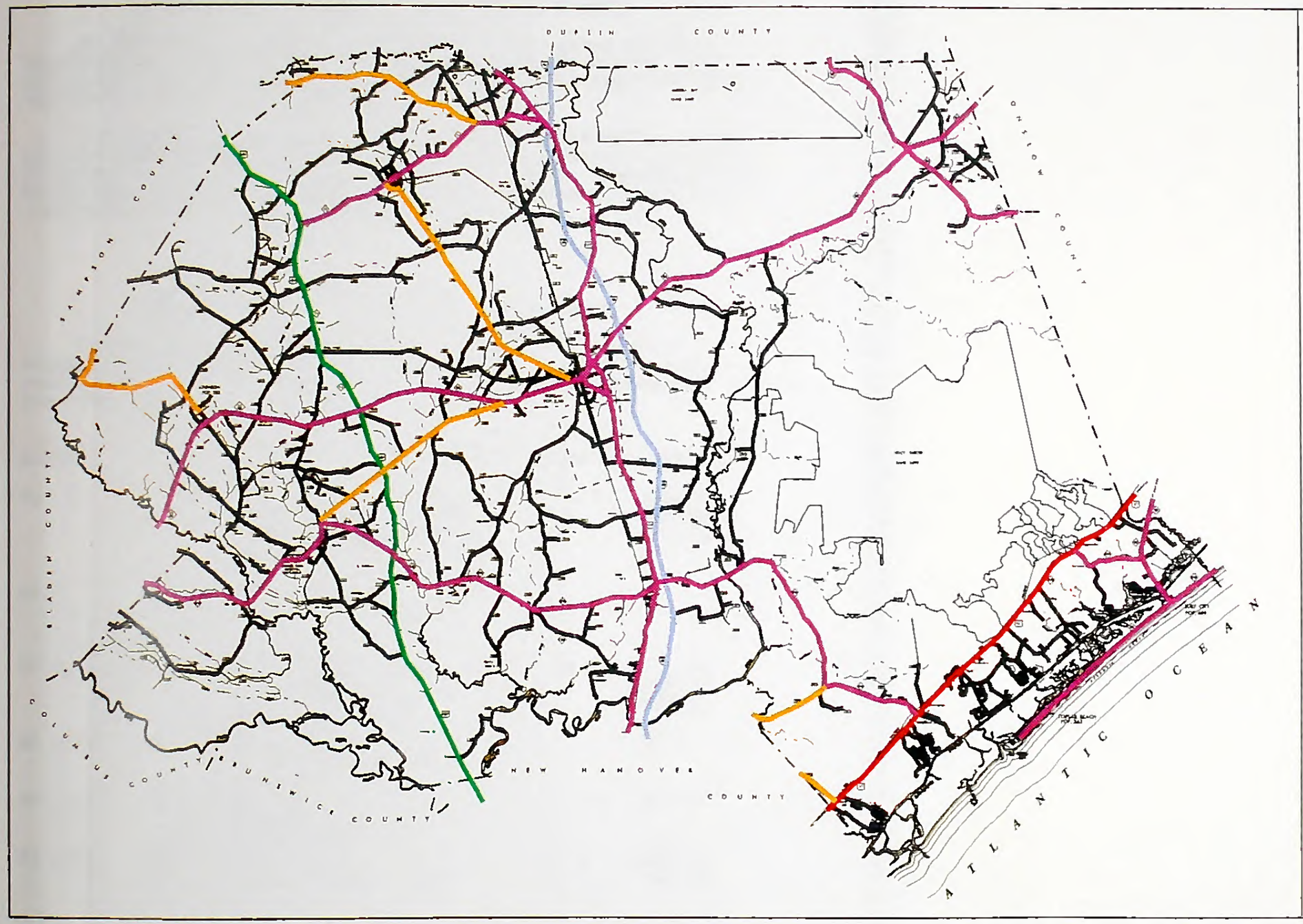


FIGURE 3-C

FUNCTIONAL CLASSIFICATION FOR PENDER COUNTY

N
S

LEGEND

- *INTERSTATE*
- *OTHER PRINCIPAL ARTERIAL*
- *MINOR ARTERIALS*
- *MAJOR COLLECTOR*
- *MINOR COLLECTOR*
- *COUNTY LINE*

PENDER COUNTY

NORTH CAROLINA

NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
DIVISION OF HIGHWAYS - GS UNIT

U.S. DEPARTMENT OF TRANSPORTATION
FEDERAL HIGHWAY ADMINISTRATION

4. RELATED PLANS AND PROJECTS

Urban Thoroughfare plans in Pender County

In addition to county thoroughfare plans, plans are also developed for urban areas. To obtain maximum efficiency from both plans, the municipality and county must work together in the development of the respective plans.

The Burgaw Thoroughfare Plan was completed in 1995. This plan includes a bypass of NC 53. The bypass location is outside of Burgaw's Extra-territorial Jurisdiction (ETJ). Therefore, the NC 53 Bypass will be included as part of the Pender County plan. (See **figure 4-A** for Burgaw Plan).

Transportation Improvement Program Projects

The Transportation Improvement Program (TIP) contains funding information and schedules for transportation projects over a 7 year period. The current TIP gives this information for 1998 thru 2004.

ROUTE	ID #	LOCATION AND DESCRIPTION	LENGTH (KM)	SCHEDULE
US 17	R-2405	I-40 AT WILMINGTON TO NC 50 AT HOLLY RIDGE. WIDEN TO MULTI-LANES PART UNDER CONSTRUCTION	37.7	DES 98 ROW 98 CON 01
US 17	R-3300	HAMPSTEAD BYPASS. FOUR LANE DIVIDED FACILITY.		PE
NC 53	R-3302	BURGAW BYPASS. CONSTRUCT A TWO LANE FACILITY WITH PAVED SHOULDERS.	9.7	P 99 DES 03 ROW PY
NC 11-53	B-2919	BLACK RIVER REPLACE BRIDGE NO. 67		UC
NC 11-53	B-3011	MOORE'S CREEK. REPLACE BRIDGE NO. 11		CON 00
SR 1120	B-2854	LONG CREEK. REPLACE BRIDGE NO. 9		ROW 98 CON 99

SR 1206	B-3886	WHITE OAK SWAMP REPLACE BRIDGE NO. 47	ROW 03 CON 04
SR 1216	B-3361	CYPRESS CREEK. REPLACE BRIDGE NO. 81	ROW 00 CON 01
SR 1304 SR 1157	B-2600	DOCTORS CREEK. REPLACE BRIDGE NO. 146	CON 97
SR 1304	B-2601	DOCTORS CREEK. REPLACE BRIDGE NO. 147	CON 97
SR 1340	B-3012	BRANCH OF LONG CREEK. REPLACE BRIDGE NO. 7	CON 00
SR .1523	B-2602	HOLLY SHELTER CREEK. REPLACE BRIDGE NO. 115	UC
SR 1561	B-2161	BEKKIE CREEK. REPLACE BRIDGE NO. 114	UC

CON: CONSTRUCTION DATE
DES: DESIGN COMPLETION DATE
IFN: IDENTIFIED FUTURE NEED
P: PROGRAMED FOR PLANNING AND ENVIRONMENTAL STUDY
PY: POST YEAR (AFTER 2002)
ROW: RIGHT OF WAY ACQUISITION DATE
UC: UNDER CONSTRUCTION

Pender County has a "Rail-to-Trail Design Study" including a master plan and report, regarding a public trail on the NCDOT Railbanked CSX line between Wallace and Castle Hayne. The North Carolina State Design Study is available from:

Al Capehart
North Carolina Rails-Trails
Post Office Box 61348
Durham, NC 27715

or by contacting the Pender County Planning Department.

In addition, there is a Pender County Waterfront Access Plan. There are five areas identified in the plan for waterfront parks. For more information, contact the Pender County Planning Department.

LEGEND

	existing	proposed
Freeway	■	■
Major Thoroughfare	■	■
Minor Thoroughfare	■	■
Interchange	●	●
Grade Separation	○	○

Adopted by:

Burgaw	11-28-95
Recommended by Statewide Planning Branch	12-06-95
NC Dept. of Transportation	1-05-96
Public Hearing	11-28-95

Burgaw	Public Hearings	Statewide Planning	N.C.D.O.T.
6-2-97	6-2-97	8-15-97	9-5-97

FIGURE 4 - A

Map Date
11-01-95

N

THOROUGHFARE PLAN
FOR
BURGAW
PENDER COUNTY
NORTH CAROLINA

Prepared by the
North Carolina Department of Transportation
Division of Highways–Statewide Planning Branch
in cooperation with
U.S. Department of Transportation
Federal Highway Administration

BASE: 1993

5. POPULATION, LAND USE, AND TRAFFIC

Pender County is located in the eastern part of North Carolina, bordered in part by the Atlantic Ocean. The County is served by I-40, US 117 and US 421 running north and south. Also, US 17, NC 50 and NC 53 serve east-west traffic. The area experiences a large number of trucks on its roads. Also, traffic is seasonally affected by beach traffic.

Factors Affecting Transportation

Population, land use, and traffic are the three major factors in determining the transportation needs of an area. In addition, travel type and frequency are also studied. The thoroughfare planning process incorporates all these variables into a plan that best meets the needs of the area.

In order to make predictions of these variables, several factors must be examined. Historic and potential population changes, significant trends in the economy, character and intensity of land development, nature of travel, and motor vehicle registration were all analyzed for this study. In addition, factors that affect development such as zoning, availability of public utilities and transportation, and the physical characteristics of the land were also studied.

Population Trends

Since the volume of traffic on a section of roadway is related to the size and distribution of population that it serves, population data is one of the tools used to determine the needs of the system.

In 1985 the population of Pender County was 24394. Current figures show a population of 32528, an average annual increase of 3.25 %. The Town of Burgaw showed a larger increase. In 1985, the population was 1829. This number grew to 2718 by 1993; an average annual increase of 5 %. Over that same period of time, the Statewide population grew 1.3 %. The State population is expected to grow to around 8.8 million by 2020 (see **figure 5-A** for township population growth).

TABLE 5-1
POPULATION

YEAR	PENDER CO POP.	NORTH CAROLINA POP.
1985	24394	6,254,998
1986	25201	6,323,174
1987	26231	6,405,868
1988	27014	6,483,344
1989	27988	6,568,810
1990	28855	6,632,448
1991	30110	6,751,713
1992	30976	6,838,230
1993	32546	6,952,424
1994	33588	7,064,470
2020	50700*	8,800,000 *

* Projected population.

Employment

Employment grew by an average rate of 2.9% from 1987 to 1993. This was slightly higher than the Statewide average of 1.9 % over the same period.

TABLE 5-2
EMPLOYMENT

Year	Employment	Annual Growth Rate PENDER	NC	NC Emp
1987	7803			3,617,997
1988	8783	12.6	1.0	3,755,795
1989	9265	5.5	1.0	3,836,047
1990	9530	2.9	1.0	3,894,202
1991	9518	-0.1	0.0	3,859,230
1992	9972	1.0	2.6	3,958,003
1993	9257	-0.7	2.5	4,056,002

Source: BEA Employment Totals

Land Use

Land use refers to the physical patterns of activities and functions within an area. Nearly all traffic problems in a specific area are relative to the area's land use. The amount of traffic on a particular street is very closely related to its adjacent land use. For example, a large industrial plant might be the cause of congestion during shift change hours as its workers come and go. However, during the remainder of the day, little, if any, problems might occur. The spatial distribution of different types of land use (sometimes referred to as traffic generators) is the predominant determinant of when, where, and why congestion occurs. The attraction between different land uses and their association with travel varies depending on the size, type, intensity, and spatial separation of each land use.

For Transportation Planning, land use is grouped into the following categories:

Residential- all land devoted to the housing of people with the exception of hotels and motels;

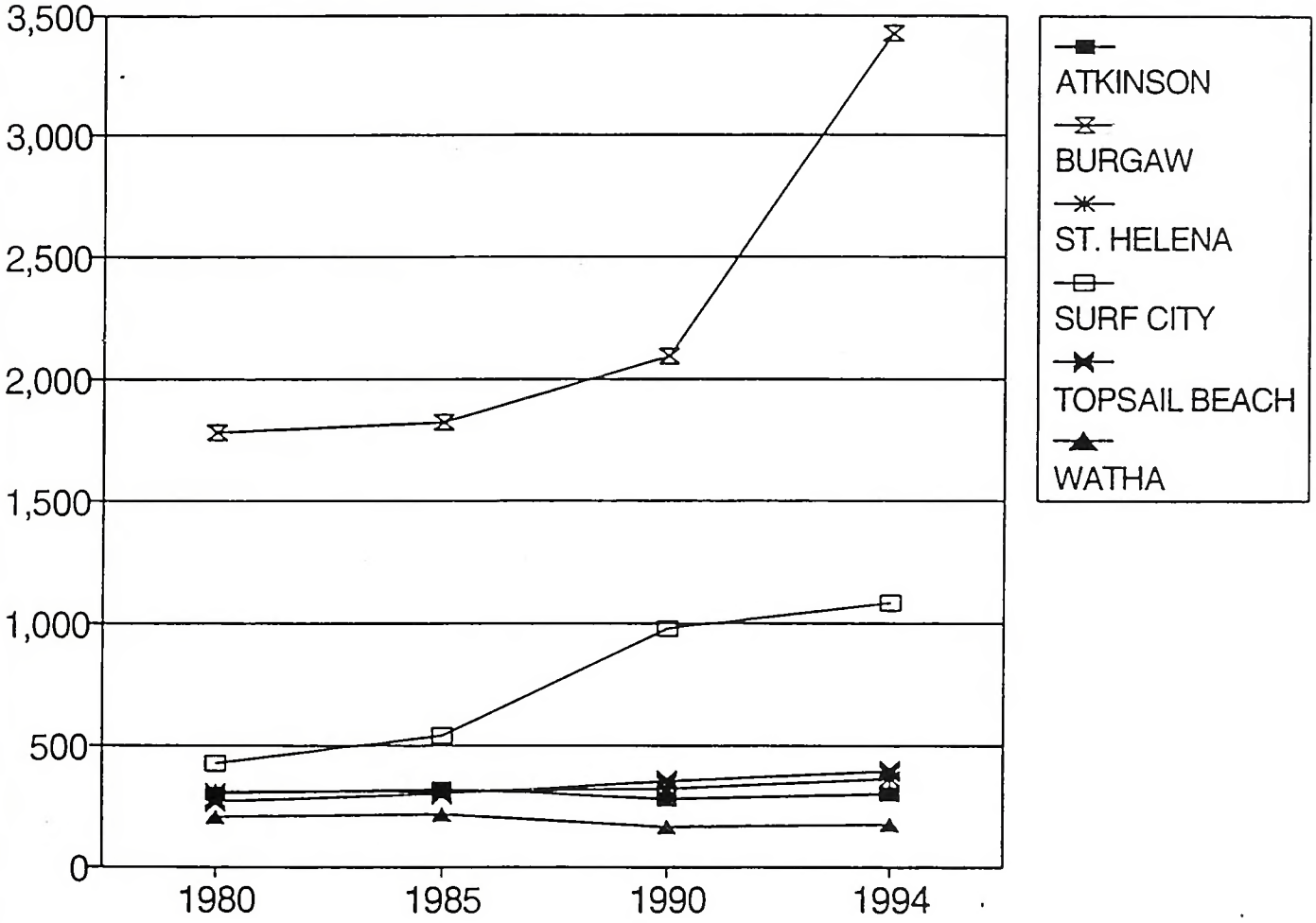
Commercial- all land devoted to retail trade including consumer and business services and their offices;

Industrial- all land devoted to manufacturing, storage, warehousing, and transportation of products;

Public- all land devoted to social, religious, educational, cultural, and political activities.

Currently, the majority of Pender County falls into the low density residential or agricultural categories. The exception to this being the southeastern portion of the County. This area has developed due to the proximity to the beach. There are also sporadic commercial and industrial areas throughout the County; specifically near Burgaw, off Stag Park Road (SR 1509). Commercial development has also occured along US 421, and NC 210. See **figure 5-B** for a general view of current land use. Refer to the 1991 Pender County Land Use Plan Update for a detailed discussion of where these types of land uses currently exist, and where the County feels they will exist in the future.

FIGURE 5-A
PENDER COUNTY POPULATION BY TOWN



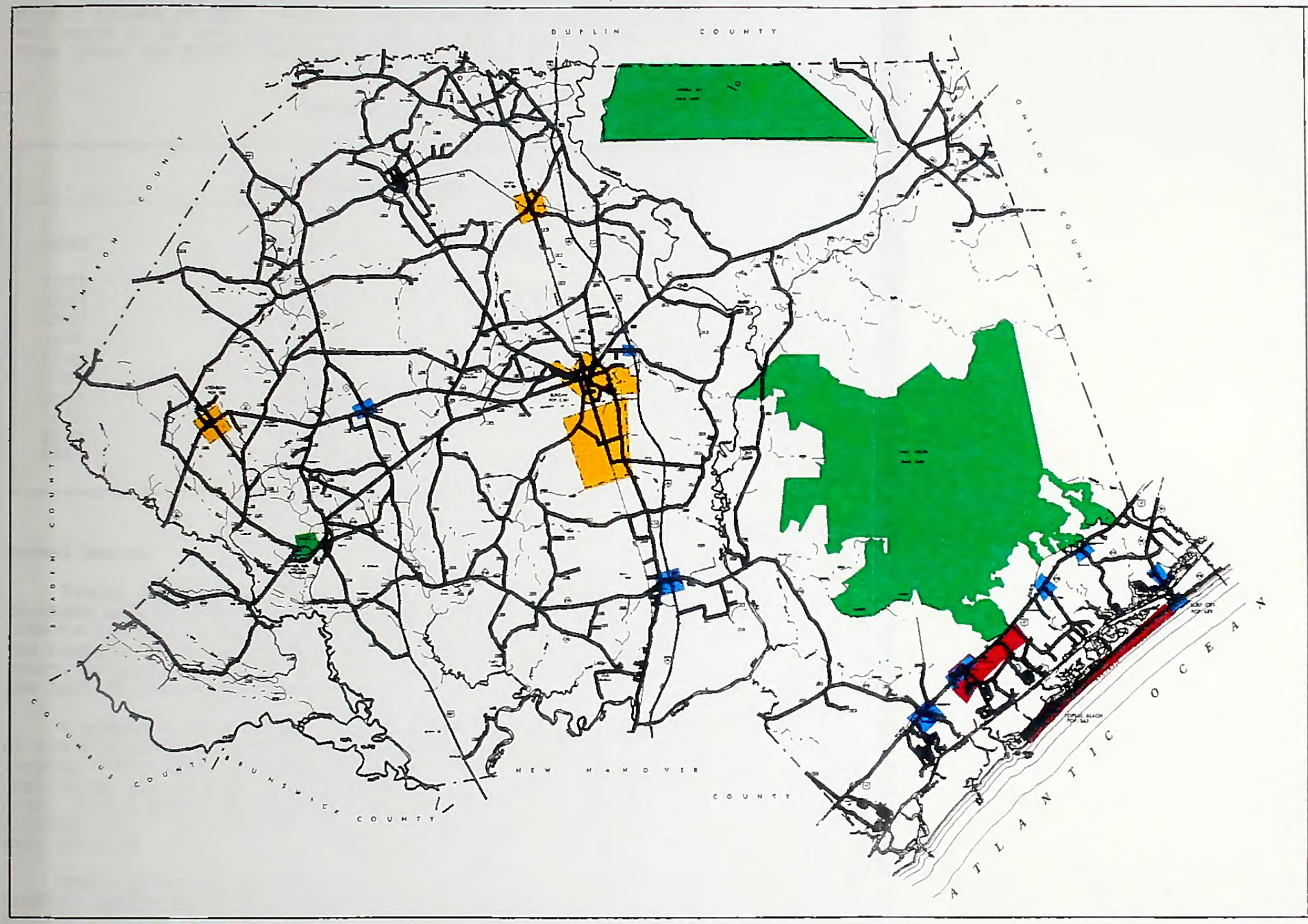


FIGURE 5-B
PENDER COUNTY
EXISTING LAND USE

N
S

LEGEND

- PARKS/GAME LAND
- HIGH DENSITY RESIDENTIAL
- COMMERCIAL/INDUSTRIAL
- MUNICIPAL

PENDER COUNTY
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Vehicle Registration

On the average, growth in vehicle registration tends to mirror growth in ADT. Vehicle registration in Pender County has grown at an average annual rate of 5.4 % since 1985, more than twice the North Carolina average of 2.5 %.

TABLE 5-3

VEHICLE REGISTRATION

YEAR	PENDER CO	NORTH CAROLINA
1985	16117	4,232,910
1986	17660	4,558,173
1987	18539	4,618,412
1988	19516	4,735,473
1989	20564	4,861,859
1990	21333	4,919,592
1991	21987	4,960,768
1992	23179	5,093,786
1993	24798	5,264,350
1994	26020	5,449,792

Travel Demand

Travel demand is usually measured by portable traffic counters and recorded in average daily traffic. This information is collected at several locations in the County. The traffic counts at each location are compared with past counts to determine a trend. For this study, the trend over the last 10 years was studied.

A growth rate is chosen after studying the area. Because of the differences in land use and growth potential, several different rates were chosen for this area. 3 % was applied to the western half of the county, and to the US 17 area. 3.5 % was used on I-40 and NC 210 from I-40 to US 17. Finally, 4.0 % was used in the area around NC 53 and NC 50 east of I-40.

These growth rates are then applied to the current traffic counts to obtain future ADT projections (See figure **5-C** for ADT and figure **5-E** for capacity deficiencies).

Capacity, Width and Alignment Deficiencies

North Carolina's standards for highway construction call for 3.3 meter (11 foot) lanes on all highways with traffic volumes greater than 2000 ADT (average daily traffic), or design speeds greater than 90 km/h (50 mph). A 2.4 meter (9 foot) lane width may be used on collector roads with an ADT of less than 400 vehicles per day. The minimum level of service for minor collector roads requires a 40 mph average overall travel speed during peak traffic conditions. **Table 5-4** gives the generally accepted minimum tolerable lane widths in North Carolina.

Table 5-4
Minimum Tolerable Lane Widths

ADT	Principal Arterials m (ft)	Minor Arterials m (ft)	Collectors m (ft)
over 2000	3.3 (11)	3.3 (11)	3.3 (11)
400-2000	--	3.0 (10)	3.0 (10)
100- 400	--	3.0 (10)	2.7 (9)
below 100	--	--	2.7 (9)

Safety

Traffic accident data was analyzed to help determine problem areas on the highway system.

Traffic accident records aid in defining problem areas and often pinpoint a deficiency such as poor design, inadequate signing, ineffective parking, or poor sight distance. Accident patterns developed from analysis of accident data can lead to improvements to reduce the number of accidents.

Both the severity and number of accidents should be considered when investigating accident data. The severity of every accident is measured with a series of weighting factors

developed by NCDOT's Division of Highways. In terms of these factors, a fatal or incapacitating accident is 47.7 times more severe than one involving only property damage. An accident resulting in minor injury is 11.8 times more severe than one with only property damage. Table 5-5 is a summery of accidents in Pender County from January 1992 thru December 1994. Only intersections with 10 or more accidents during this period are included.

The "Total" column is the total number of accidents within 100 feet of the intersection during the indicated period. The severity listed is the average accident severity for that location.

TABLE 5-5
PENDER COUNTY
Intersections with 10 or more accidents
(From Jan. 1992 to Dec. 1994)

INTERSECTION OF	AND	TOTAL	SEVERITY INDEX
US 17	NC 210	45	7.82
US 117	NC 210	33	11.48
US 117	NC 53	26	17.85
NC 50	NC 53	26	14.58
US 117	SR 1412	19	23.67
US 17	SR 1565	18	7.27
US 17	SR 1570	16	5.16
US 421	NC 53	15	14.56
US 421	NC 210	14	15.00
NC 53	SR 1121	11	31.25
US 117	NC 133	11	25.71
NC 53	SR 1520	10	34.28
NC 50	NC 210	10	3.96

These intersections warrant further study to determine the cause, and possible solutions. This, however, is beyond the scope of this study.

Bridge Conditions

In addition to all the inconveniences that bridge failures cause, they also represent the greatest risk of all highway failures for loss of life. For this reason it is important that bridges be built to the same standards as the highway system they serve.

The North Carolina DOT's Bridge Maintenance Unit, along with consultants, has inspected every bridge on the State Highway System. During this inspection, a sufficiency rating was assigned to each bridge. Factors used in determining the sufficiency rating include structural adequacy and safety, serviceability and functional obsolescence, essentialness for public use, structure type, and traffic safety features. The result is in percentage form with 100 % being entirely sufficient. A rating of 50 % or less qualifies a bridge for Federal Replacement Funds under the National Bridge Inspection Program (Federal Highway Act 1968).

Listed below are all bridges in Pender County with a sufficiency rating of 50 % or less.

TABLE 5-6

#	Facility	Over	Location	Rat
1	SR1520	Shaken Creek	2.3 Mi N of SR 1522	11.8
2	SR1103	Lyon Creek	1.0 Mi S of SR 1104	17.0
3	SR1523	Holly Shelter Creek	0.4 Mi S of NC 53	17.2
4	SR1561	Bekkie's Creek	0.2 Mi N of SR 1563	22.0
5	SR1120	Long Creek	2.6 Mi E of us 421	23.5
6	NC 210	NE Cape Fear River	2.8 Mi E of US 117	24.2
7	NC 11	Moore's Creek	0.7 Mi S of SR 1121	24.3
8	SR1206	White Oak Swamp	0.3 Mi S of SR 1209	27.4
9	SR1304	Doctors Creek	0.3 Mi N of SR 1303	28.5
10	SR1304	Doctors Ck Overflow	0.1 Mi N of SR 1303	28.5
11	SR1305	Doctors Creek	0.8 Mi N of SR 1001	28.7
12	NC 50	Inland Waterway	0.4 Mi N of NC 210	33.3
13	SR1340	Long Creek	0.6 Mi N of NC 53	34.6
14	SR1580	Moore Creek Branch	0.6 Mi E of NC 50	35.2
15	SR1306	Sills Creek	1.1 Mi W of SR 1308	37.0
16	SR1336	Long Creek	0.5 Mi S of NC 53	37.4
17	SR1216	Cypress Creek	0.8 Mi W of SR 1338	38.3
18	SR1207	White Oak Creek	0.8 Mi S of SR 1209	41.9
19	NC 53	NE Cape Fear River	3.6 Mi E of US 117	44.5
20	NC 53	Angola Creek	2.0 Mi W of NC 50	45.9
21	SR1128	Moore's Creek Branch	1.4 Mi S of NC 53	46.2
22	NC 133	Turkey Creek	0.4 Mi N of SR 1437	46.3
23	NC 210	Black River	0.4 Mi E of SR 1103	47.7
24	SR1325	Sill's Creek Branch	0.4 Mi W of SR 1324	47.8

The following bridge received a rating of 50 % or less in the category termed functionally obsolete:

#	Facility	Over	Location	Rat
25	SR1520	Holly Shelter Creek	0.5 Mi N of SR 1316	44.1

Numbers correspond with numbers on figure **5-D** .

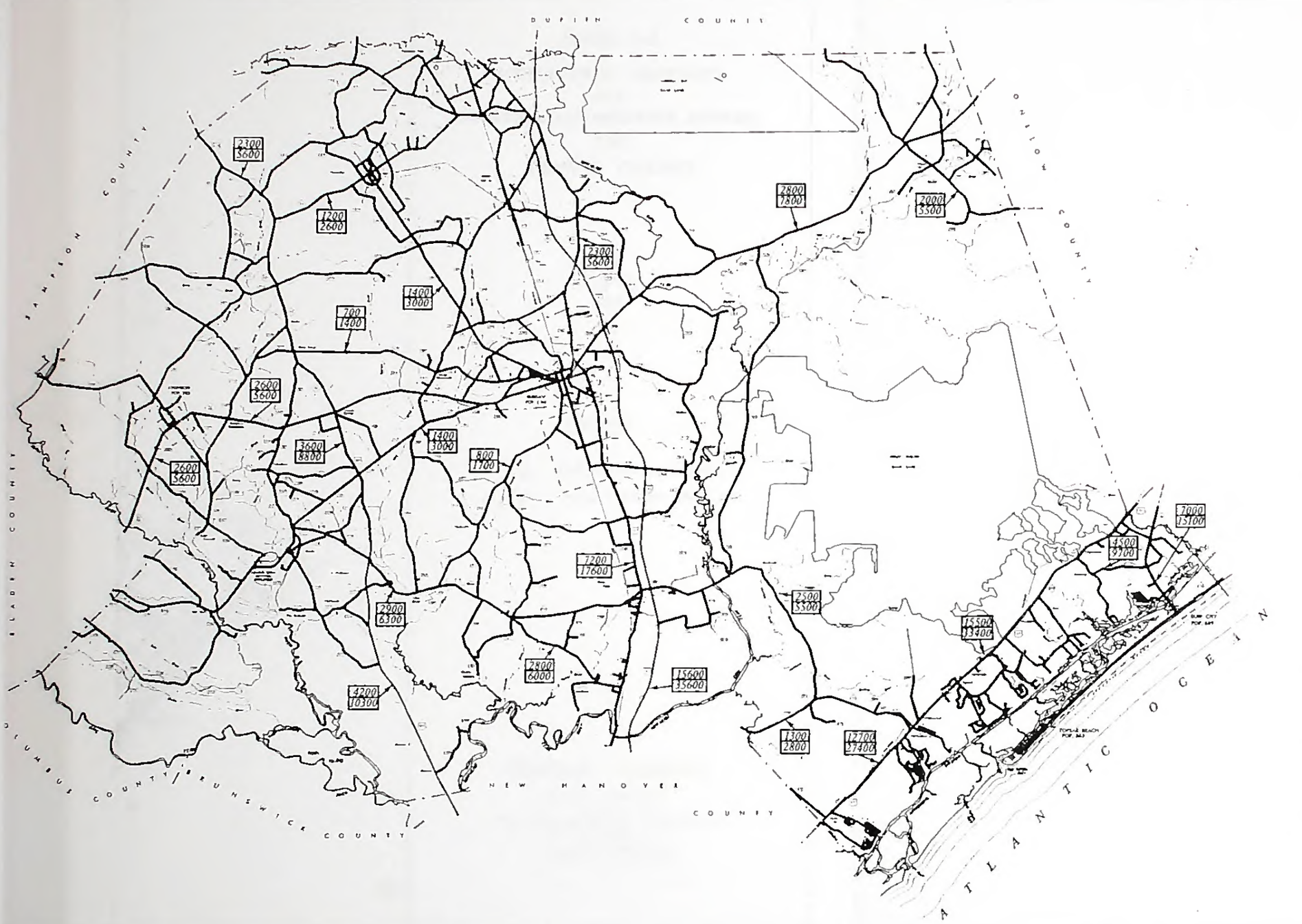

FIGURE 5-C

SELECTED
AVERAGE DAILY TRAFFIC COUNTS
FOR

PENDER COUNTY

N
S

LEGEND

1994 / 2020 — AVERAGE DAILY TRAFFIC / AVERAGE DAILY TRAFFIC

PENDER COUNTY

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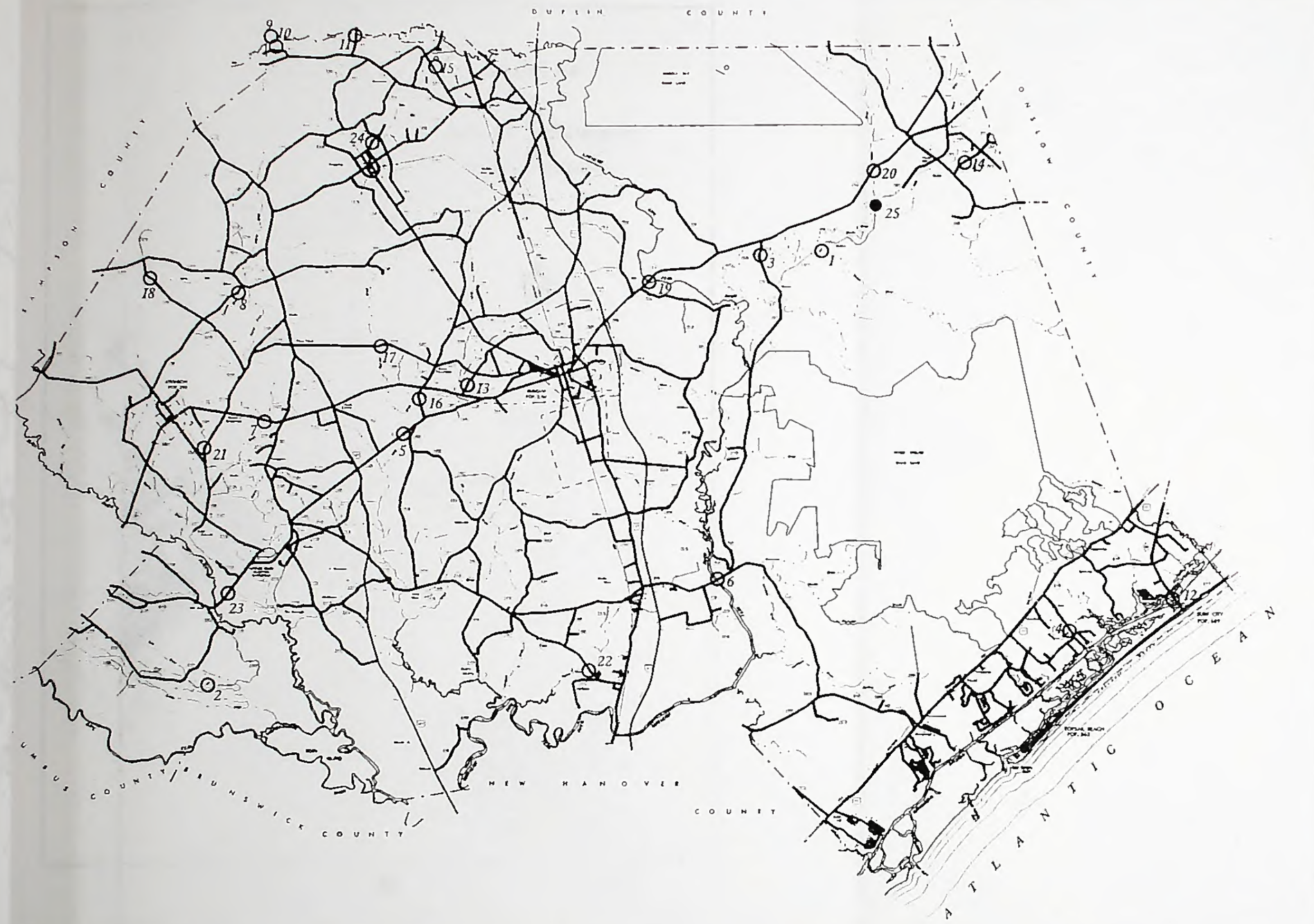

FIGURE 5-D

STRUCTURALLY DEFICIENT
AND
FUNCTIONALLY OBSELETE BRIDGES
FOR
PENDER COUNTY

N
S

LEGEND

○ *STRUCTURALLY DEFICIENT*

● *FUNCTIONALLY OBSELETE*

PENDER COUNTY

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DIVISION OF HIGHWAYS - GIS UNIT

U.S. DEPARTMENT OF TRANSPORTATION
FEDERAL HIGHWAY ADMINISTRATION

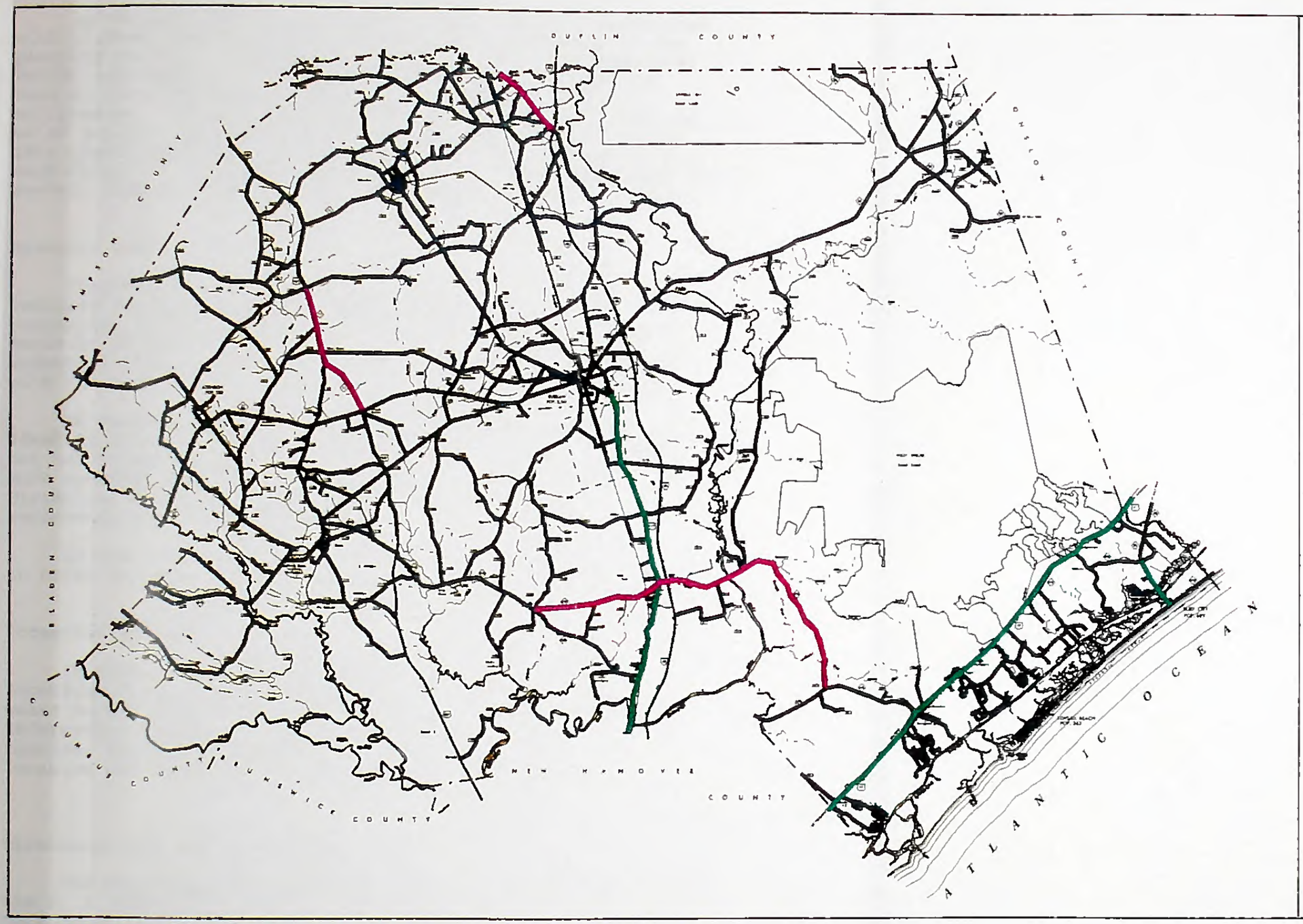

FIGURE 5-E

CAPACITY DEFICIENCIES FOR PENDER COUNTY

N
S

LEGEND

$0.8 \leq V/C < 1.0$

$V/C \geq 1.0$

PENDER COUNTY

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DIVISION OF HIGHWAYS - OS UNIT

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6. ENVIRONMENTAL CONCERNS

In the past few years, environmental concerns associated with highway construction have come to the forefront of the planning process. Section 102 of the National Environmental Policy Act requires an Environmental Impact Statement for road projects that have a significant impact on the environment. The EIS includes impacts on wetlands, wildlife, water quality, historic properties and public lands. While this report does not cover the environmental concerns in as much detail as an EIS would, preliminary research was done on several factors and the information found is included below.

Historic Sites

Section 106 of the National Historic Preservation Act requires the Department of Transportation to identify properties listed in, as well as eligible for the National Register of Historic Places. The DOT must consider the impact of its road projects on these properties and consult with the Federal Advisory Council on Historic Preservation.

NC General Statute 121-12(a) requires the DOT to identify historic properties listed on the national register, but not necessarily those eligible to be listed. The DOT must consider impacts and consult with the North Carolina Historical Commission, but is not bound by their recommendations (see **figure 6-A**).

In addition to historic sites, Gamelands were located in order to avoid these natural resources (see **figure 6-A**.)

Potential Hazards

In order to avoid potential hazards, areas such as Superfund Sites, solid and hazardous waste facilities, and water supply intakes were located using the Geographic Information System (see **figure 6-B**). This report does not consider the type or severity of each item; rather, the location was noted for the purpose of avoidance.

Threatened and Endangered Species

The Threatened and Endangered Species Act of 1973 allows the U. S. Fish and Wildlife Service to impose measures on the Department of Transportation to mitigate the environmental impacts of a road project on endangered animal and plant species, as well as critical wildlife habitats. These species and areas were located using mapping and information provided

by the North Carolina Department of Environment, Health and Natural Resources. Locating these species during the planning stage should minimize the effects of road construction. Specific information may be obtained on each occurrence from the Department of Environment, Health and Natural Resources.

The Natural Heritage Program seeks out threatened and endangered species. Species are identified, and the location is mapped for future reference. In addition, the Natural Heritage Program identifies and catalogs natural communities, special habitats, and geologic features.

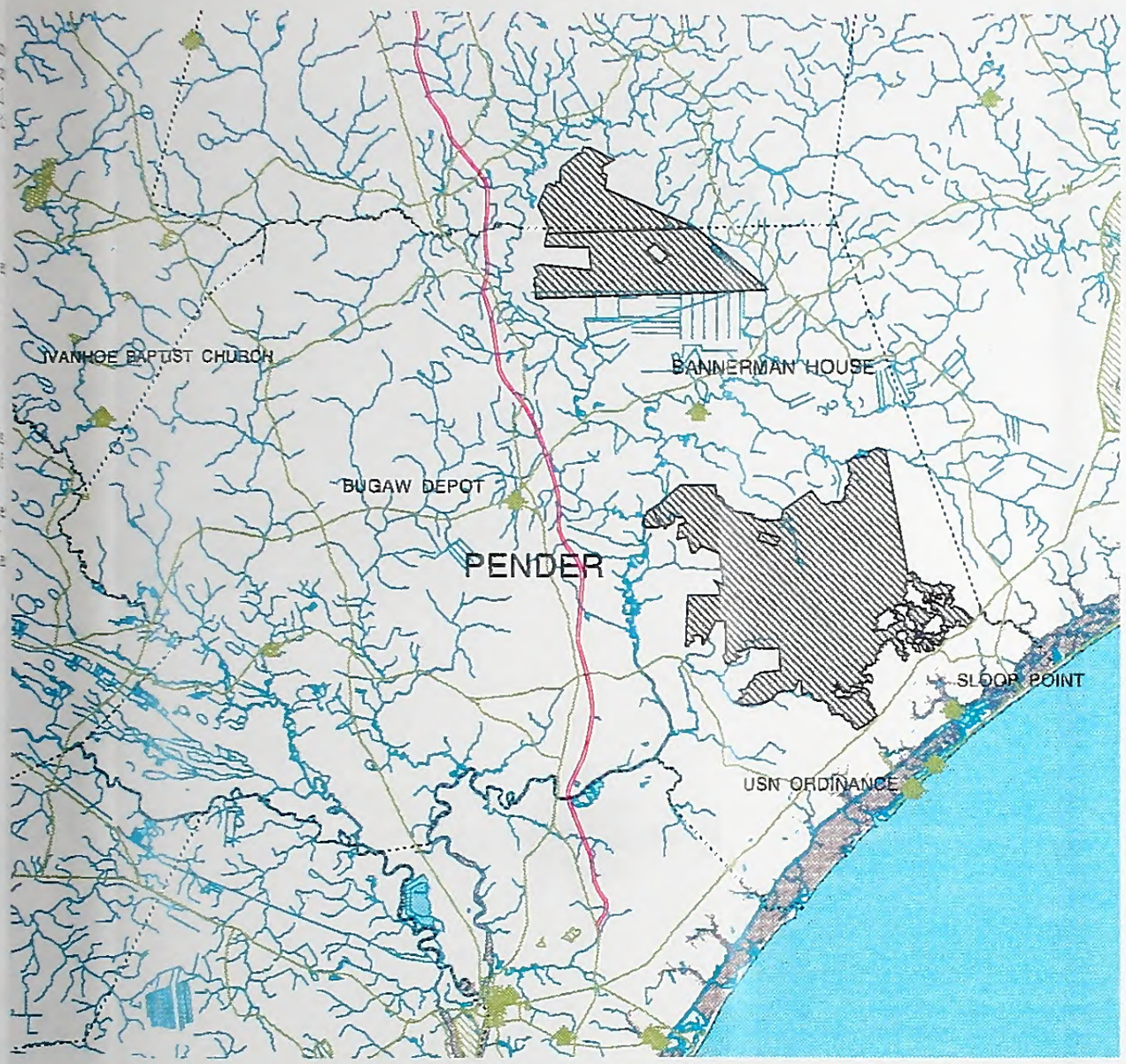
Archaeological Sites

Caution should always be used when constructing in an area that could contain archaeological information or artifacts. The plan does not affect any currently known archaeological sites.

Wetlands

A large portion of eastern Pender County is wetlands. This was one of the main reasons for choosing widening of existing NC 50 and NC 53, rather than constructing new facilities. Wetlands were located using the United States Department of the Interior's National Wetlands Inventory Mapping for Pender County. Future projects should be planned to minimize the effects on these areas (see **figure 6-C**).

PENDER COUNTY HISTORIC AND PROTECTED PROPERTIES



Primary Roads (Statewide Line)
- Projected
- Divided Highway
- Not Divided Highway
- Two Lane Road
- Historic Structures/Districts (Statewide Point)

Historic Structures/Districts (Statewide Poly)
- DK
- NR
- County Names

County Boundary (Statewide 100k)
- County Boundary
- State Boundary
- Shore Line
- State Parks (Statewide)

Federal Lands (Statewide)
- Federal Lands

Gamelands (Statewide)
- Private
- Public

Fisheries Nursery Areas (Statewide)
- .1405 Primary
- .1407 Secondary
- .1408 Special

Natural Areas (NE Coastal APES Area)
- Natural Areas

100k DEM Hyrography (Lines)
- Hydrography Line

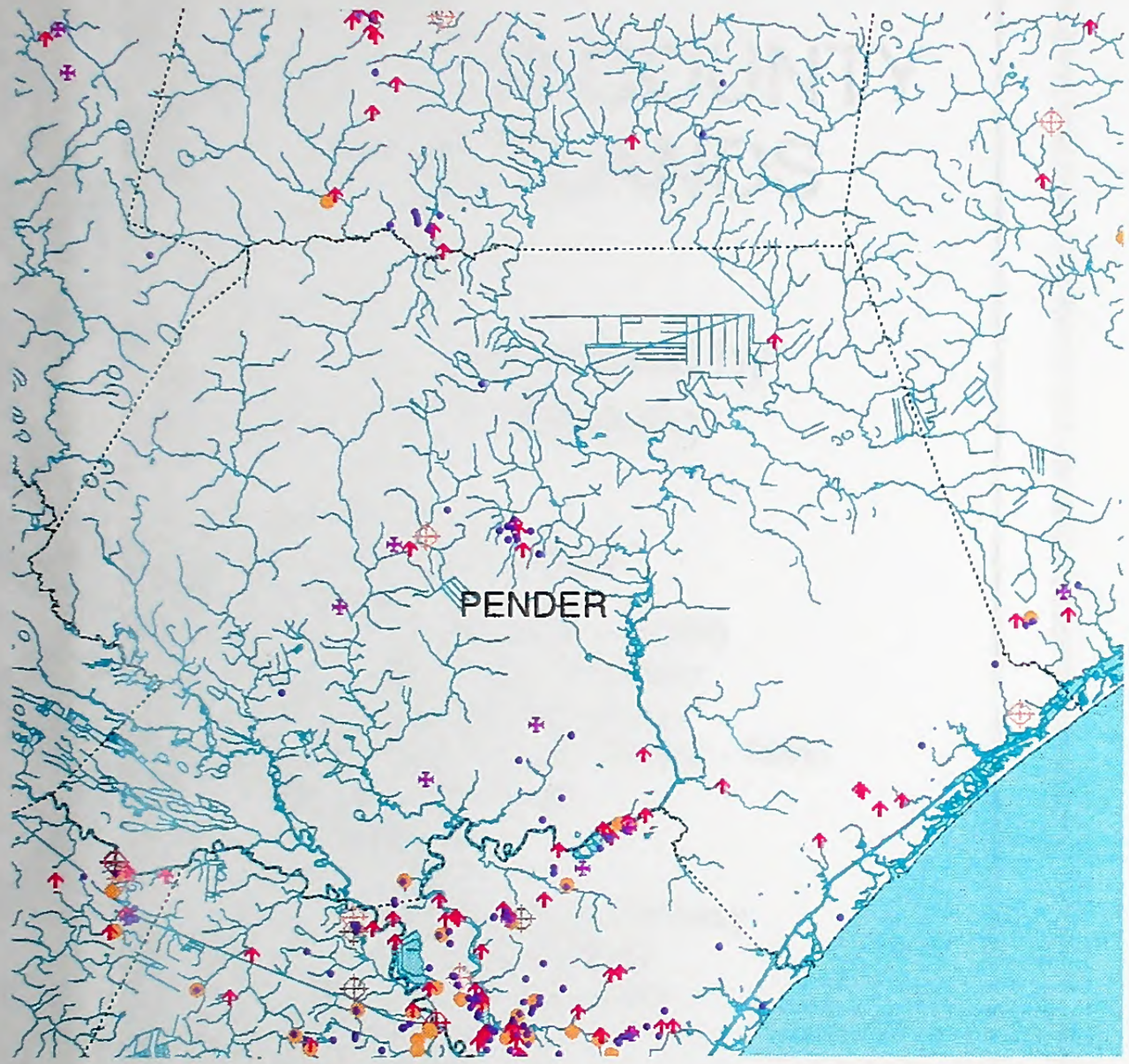
100k DEM Hydrography (Statewide)
- Hydrography Polygon
- Hydrography Polygon

N
W E
S

20 0 20 40 Miles

FIGURE 6-A

ENVIRONMENTAL CONCERNS



- Groundwater Incidents (Statewide)
- Non-Discharge System (Statewide)
- Hazardous Waste Facilities (Statewide)
- Solid Waste Facility; Landfills (Statewide)
- National Pollutant Discharge Elimination System (NPDES)
- Superfund Site (As Point)
- County Names

County Boundary (Statewide 100k)

- County Boundary
- State Boundary
- Shore Line
- Water Supply Intakes (Statewide)

100k DEM Hyrography (Lines)

- Hydrography Line

100k DEM Hydrography (Statewide)

- Hydrography Polygon
- Hydrography Polygon

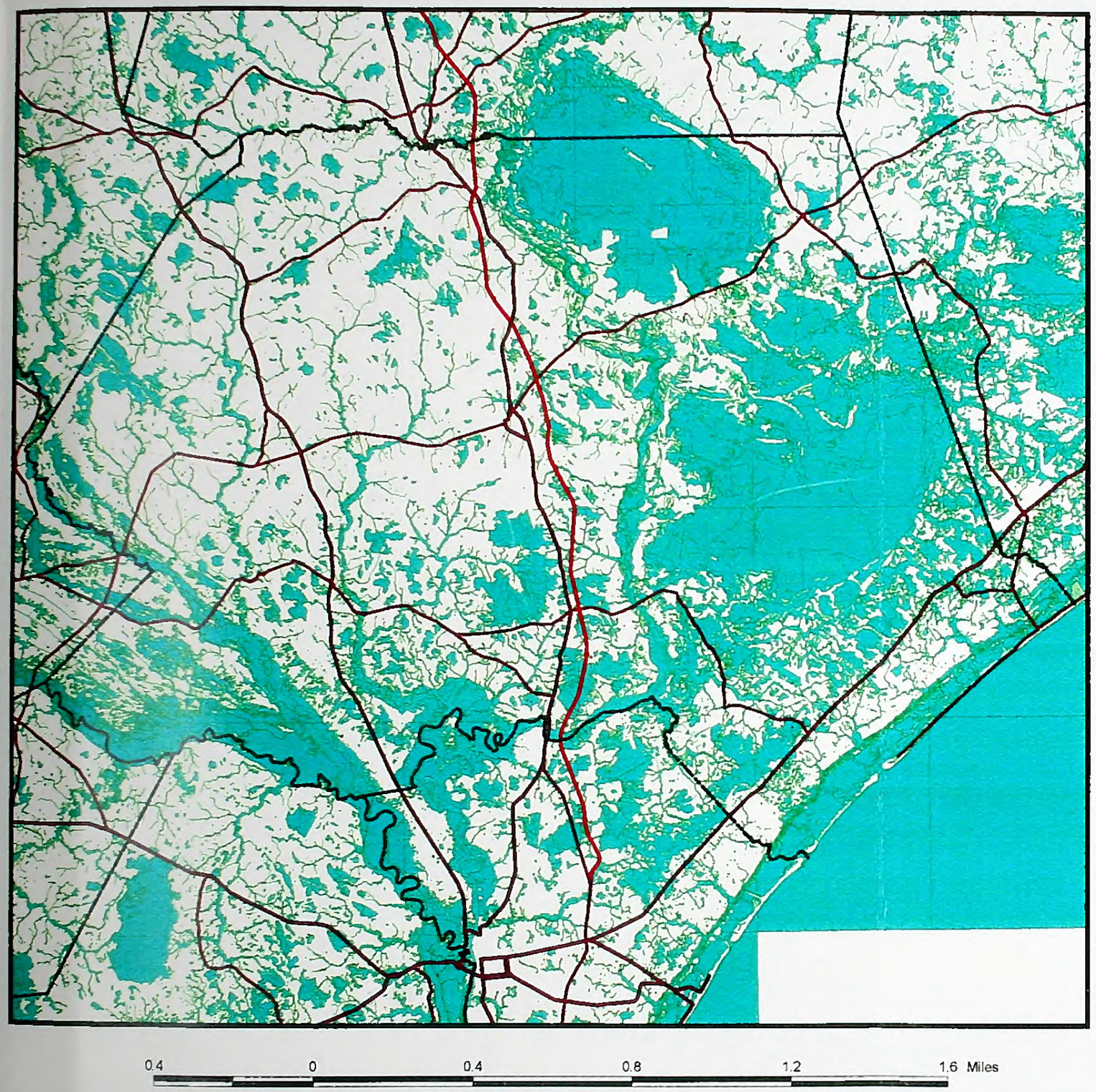
19 0 19 38 Miles

FIGURE 6-B

Figure 6-C

PENDER COUNTY WETLANDS

As Determined by NWI Mapping



LEGEND

County Boundary (100K)
- County Boundary
- State Boundary

Roads (Primary Routes - 100k)
- Interstate
- U.S.
- N.C.
- Blue Ridge Parkway

NWI (arc-24k)

NWI (poly-24k)

N

7. MUNICIPAL AND PUBLIC INVOLVEMENT

Work on the Pender County Thoroughfare Plan began in October of 1995. However, the study was put on hold pending completion of the Burgaw Thoroughfare Plan.

A presentation was made before the County Commissioners October 16, 1995 to inform them that a study was underway. They were also informed of the decision to put the study on hold until the Burgaw plan was completed.

On February 1st and 2nd, meetings were held with local officials to give them an opportunity to voice concerns they would like the Thoroughfare Plan to address.

April 2, 1996, the Pender County Thoroughfare Plan was presented to the County Planning Board. Questions centered around the eastern portion of the County, specifically NC 53, NC 50, and US 17. The Planning Board asked that these areas be studied closely, and made suggestions concerning improvements to these areas. There was also a request to improve travel from I-40 to US 17 along NC 210. It was suggested to construct a new section to bring this traffic into US 17 North of Hampstead.

The suggestions were studied, and the plan was revised and presented in an advertised public hearing June 4, 1996. The questions and concerns from the previous meeting were answered to the satisfaction of the Board, and the plan was recommended to the County Commissioners.

July 1, 1996, the Thoroughfare Plan was presented to the County Commissioners. The Commissioners requested a public hearing on the plan. The County also requested the hearing be delayed until October, 1996.

October 21, 1996, met with County Commissioners at an advertised public hearing. Concerns were voiced concerning the NC 53 Bypass. An additional public hearing was requested.

January 21, 1997, at this hearing, the County Commissioners requested that the Burgaw Town Board look at alternative bypass locations in addition to the location Burgaw adopted.

April 7, 1997, the Burgaw Town Board requests a joint public hearing with the Pender County Commissioners to choose a bypass location.

June 2, 1997, joint public hearing with the County Commissioners and the Burgaw Town Board. The County requested that the alignment be altered as shown on the proposed Thoroughfare Plan map, dated June 2, 1997. Although this alignment passes through a proposed park, the County Commissioners support it. The reduction of the park size from 80 acres to approximately 65 acres would not affect the County's plan for developing the park. In addition, the County would benefit from the access that the proposed location would provide.

The Pender County Commissioners were advised that there was a potential problem with this alignment. An endangered species of plant had been found in the vicinity of the proposed corridor. The County was still in favor of this location. At the end of the public hearing, the Commissioners voted to approve the Pender County Thoroughfare Plan with the NC 53 Bypass passing through the proposed park.

8. IMPROVEMENT PRIORITIES

The improvements in the Pender County Thoroughfare Plan obviously cannot be undertaken all at once, nor should they be. The cost would be overwhelming and the need for many of the improvements is not immediate. In an effort to reflect the relative value of various improvements, an assessment has been made of the benefits that can be expected from each project. A comparison was then made to the projected costs involved. The result of this benefit-cost analysis is the development of a listing of priorities for those recommended improvements.

Roadway Project Priorities

Priorities have been set by comparing the benefits that will result from each roadway project to the expected project costs. Three principal measures of benefits were used: road user cost savings; the potential for increased economic development resulting from the improvement; and the environmental impact, both positive or negative, which might result. The first measure is an actual estimate of dollar savings, while the others are estimates of the probability of the resulting change.

Reduced road user costs should result from any roadway improvement, from a simple widening to the construction of a new roadway to relieve congested or unsafe conditions. Comparisons of the existing and the proposed facilities have been made in terms of vehicle operating costs, travel time costs, and accident costs. These user benefits are computed as total dollar savings over the 25 year design period using data such as project length, base year and design year traffic volumes, traffic speed, type of facility, and volume/capacity ratio.

The impact of a project on economic development potential is shown as the probability that it will stimulate the economic development of an area by providing access to developable land and reducing transportation costs. It is a subjective estimate based on the knowledge of the proposed project, local development characteristics, and land development potential. The probability is rated on a scale from 0 (none) to 1.00 (excellent).

The environmental impact analysis considers the effect of a project on the physical, social/cultural, and economic environment. **Table 8-1** lists the items that are considered when evaluating the impact on the environment. Many of these have been accounted for in evaluating the project with respect to user benefits, cost, and economic development potential. However, thirteen environmental factors are generally considered in these evaluations. They are the environmental impacts of a project on: (1) air quality, (2) water resources, (3) soils and geology, (4) wildlife, (5) vegetation, (6) neighborhoods, (7) noise, (8) educational facilities, (9) churches, (10) parks and recreational facilities, (11) historic sites and landmarks, and (12) public

health and (13) safety. The summation of both positive and negative impact probabilities with respect to these factors provides a measure of the relative environmental impact of a project.

TABLE 8-1
Environmental Considerations
Physical Environment
Air quality
Water Resources
Soils and Geology
Wildlife
Vegetation
Social and Cultural Environment
Housing
Neighborhoods
Noise
Educational Facilities
Churches
Parks and Recreational Facilities
Public Health and Safety
National Defense
Aesthetics
Economic Environment
Businesses
Employment
Economic Development
Public Utilities
Transportation Costs
Capital Costs
Operation and Maintenance Costs

Offsetting the benefits that would be derived from any project is the cost of its construction. A new facility, despite its high projected benefits, might prove to be unjustified due to the excessive costs involved in construction. The highway costs estimated in this report are based on the average statewide construction costs for similar project types. An estimate of anticipated right-of-way costs is also included. **Table 8-2** evaluates the proposed Pender County projects with respect to user benefits, estimated costs, probability of economic development, and environmental impact.

To guide both the State and the County in their efforts to implement the improvements recommended in this report, the proposed projects have been placed in order of priority. These priorities are shown in **Table 8-2.** Since conditions are constantly changing with time, these priorities should be periodically reevaluated by the County and the Division Engineer. Other roadway improvements, which can be identified from Appendix A, are considered to be minor or low priority projects.

Bridge Replacement Priorities

The deficient bridges shown in **Table 8-3** were placed in three priority groups based on computer data and information supplied by the Bridge Maintenance Unit of the North Carolina Department of Transportation. Data such as the remaining life of the bridge, length, width, sufficiency rating, and traffic volume were used to determine these priorities.

TABLE 8-2

BENEFITS EVALUATION FOR PENDER COUNTY
MAJOR UNFUNDED PROJECTS

PROJECT	LENGTH (MILES) [KM]	TOTAL BENEFIT (IN MILLIONS OF $)	EST COST	ECONOMIC DEVELOPMENT POTENTIAL PROBABILITY	ENVIRONMENTAI IMPACT PROBABILITY
US 117 WIDENING Burgaw SPL to New Hanover County Widen to Four Lane Freeway	12.0 [19.3]	89	24.3	.19	+ .14 - .14
US 17 BYPASS North of Scotts Hill to SR 1675	7.1 [11.5]	220	22.5	.25	+ .21 - .35

NOTE: Projects are listed by Priority, with highest priority first. Also, ultimate recommendations and projects already included in the 1997-2003 Transportation Improvement Program are not included in the benefit analysis.

Bridge Replacement Priorities

#	Facility	Over	Location	Rat
First Priority				
116	SR1520	Shaken Creek	2.3 Mi N of SR 1522	11.8
17	SR1103	Lyon Creek	1.0 Mi S of SR 1104	17.0
115	SR1523	Holly Shelter Ck	0.4 Mi S of NC 53	17.2 *
114	SR1561	Bekkie's Creek	0.2 Mi N of SR 1563	22.0 *
9	SR1120	Long Creek	2.6 Mi E of US 421	23.5 *
21	NC 210	NE Cape Fear	2.8 Mi E of US 117	24.2
11	NC 11	Moore Creek	0.7 Mi W of SR 1121	24.3 *
47	SR1206	White Oak Swamp	0.3 MI S of SR 1209	27.4
Second Priority				
146	SR1304	Doctors Creek	0.3 Mi N of SR 1303	28.5 *
147	SR1304	Doctors Creek	0.1 Mi N of SR 1303	28.5 *
63	SR1305	Doctors Creek	0.8 Mi N of SR 1001	28.7
16	NC 50	Intrcoastal Wtr	0.4 Mi N of NC 210	33.3
7	SR1340	Long Creek	0.6 Mi N of NC 53	34.6 *
213	SR1580	Moore Creek	0.6 Mi E of NC 50	35.2
68	SR1306	Sills Creek	1.1 Mi W of SR 1308	37.0
79	SR1336	Long Creek	0.5 Mi S of NC 53	37.4
Third Priority				
81	SR1216	Cypress Creek	0.8 Mi W of SR 1338	38.3 *
48	SR1207	White Oak Creek	0.8 Mi S of SR 1209	41.9
34	NC 53	Cape Fear River	3.6 Mi E of US 117	44.5
37	NC 53	Angola Creek	2.0 Mi W of NC 50	45.9
32	SR1128	Moore Creek	1.4 Mi S of NC 53	46.2
14	NC 133	Turkey Creek	0.4 Mi N of SR 1437	46.3
44	NC 210	Black River	0.4 Mi E of SR 1103	47.7
202	SR1325	Sills Creek	0.4 Mi W of SR 1324	47.8

* Included in 1996-2002 Transportation Improvement Program.

9. IMPLEMENTATION

There are several methods through which a local government may implement a Thoroughfare Plan. Suggested methods for the projects in the Pender County Thoroughfare Plan are listed below and are summarized in Table **9-1**. The remainder of this chapter describes the various methods of implementation.

Pender County Thoroughfare Plan: Suggested Project Implementation

The following text lists each of the recommended projects, their estimated cost, and a recommended method of implementation. The recommendations of this chapter are summarized in Table **9-1**. In addition, a cost benefit comparison is provided in Table **8-2**. For all projects, it is recommended that the County use its subdivision regulations and zoning ordinances in conjunction with the Thoroughfare Plan to preserve corridors and prevent encroachment of development that could prevent, or increase the cost of construction.

1. **US 17 Widening** I-40 to Holly Ridge. This project is currently under construction.

2. **NC 53 Bypass** Burgaw Area. Initial Estimate $8,100,000 ($6,000,000 Construction, $2,100,000 Right of Way). This project currently appears in the State Transportation Improvement Program as scheduled for construction.

3. **US 117 Widening** Burgaw's southern planning boundary to New Hanover County. Initial Estimate $24,300,000 ($23,400,000 Construction, $900,000 Right of Way). Increasing the capacity of US 117 will become necessary as traffic continues to increase. The best source for funding will be the State Transportation Improvement Program.

4. **US 17 Bypass** Hampstead Area. Initial estimate $22,500,000 ($19,800,000 Construction, $2,700,000 Right of Way). This project will ease the congestion around this growing area. The best source for funding will be the State Transportation Improvement Program.

5. **NC 50 Widening** NC 53 to NC 210. Initial estimate $76,400,000 ($71,500,000 Construction, $4,900,000 Right of Way). This project, in conjunction with the widening of NC 53 is included as an ultimate recommendation. Traffic projections do not show a need within the planning period; however, it should be considered as a long range goal.

6. **NC 53 Widening** I-40 to NC 50. Initial estimate $38,500,000 ($36,900,000 Construction, $1,600,000 Right of Way). See description of NC 50 widening.

Implementation Methods
State-Municipal Adoption of the Thoroughfare Plan

In general, the State is responsible for those facilities which will be serving major volumes of through traffic and traffic from outside the area to major commercial, industrial, and institutional areas inside municipalities. Those facilities which will serve primarily internal traffic are to be a municipal responsibility.

Administrative controls and implementation methods that can aid in the implementation process are generally available to municipalities through Federal and State legislation. These controls and methods include, but are not limited to: subdivision regulations, zoning ordinances, official maps, urban renewal, capital improvements programs, and development reviews. Generally, two issues play a major role in the implementation process; available finances and citizen involvement. Effective use of the controls and methods listed above are indicative of good planning and minimize the effect of limited finances and negative citizen reaction to specific elements of the plan. It is through good planning that maximum use is made of every available dollar and that citizen involvement and approval of the Thoroughfare Plan is obtained.

Subdivision Regulations

Subdivision regulations require every subdivider to submit to the local planning commission a plan of his proposed subdivision and requires that the subdivision be constructed to certain standards. Through this process, it is possible to require the subdivision streets to conform to the Thoroughfare Plan and to reserve or protect necessary rights-of-way for projected roads and highways that are to become a part of the Thoroughfare Plan. The construction of subdivision streets to adequate standards would reduce maintenance costs and would facilitate the transfer of the streets to the State Highway System. Appendix B outlines the recommended design standards.

Roadway Corridor Official Map

North Carolina General Statutes 136-44.50 through 133-44.53 are collectively designated as the "Roadway Corridor Official Map Act." For cities contemplating the adoption of a Roadway Corridor Map, more commonly referred to as an Official Street Map, there are several things to consider prior to implementation. First and foremost, it should be recognized that an Official Street Map places severe, but temporary, restrictions on private property rights. These restrictions are in the form of a prohibition, for a period of up to three years, for the issuance of building permits or subdivision of property lying within an Official Street Map corridor. This authority should be used carefully and only in cases where less restrictive powers will be ineffective.

The Statute establishing the Official Street Map authority is fairly explicit in outlining the procedures to be followed and the types of projects to be considered. As required by the Statute, a project being considered for an Official Street Map must be programed in the State's Transportation Improvement Program (TIP) or included in a locally adopted capital improvement plan, in addition to appearing on the adopted street system plan. The Statute states that the capital improvement plan must be for a period of ten years or less, and must identify the estimated cost of acquisition and construction of the proposed project as well as the anticipated financing.

The Program and Policy Branch of the North Carolina Department of Transportation is responsible for facilitating the adoption of Official Street Maps. Cities considering Official Street Map projects should contact the Program Development Branch for their "Guidelines for Municipalities Considering Adoption of Roadway Corridor Maps" at:

Program Development Branch
NC Department of Transportation
P.O. Box 25201
Raleigh, NC 27611

Zoning

A zoning ordinance can be beneficial to thoroughfare planning in that planned locations of various land uses and planned densities of dwellings can be realized. This provides a degree of stability on which to make future traffic projections and to plan streets and highways.

Other benefits of a good zoning ordinance are: (1) the establishment of standards of development which will aid traffic operations on major thoroughfares, and (2) minimizing strip commercial development which creates traffic friction and increases the traffic accident potential.

Urban Renewal

Urban renewal is defined as the rehabilitation of downtown areas by demolishing, remodeling, or repairing existing structures in accordance with comprehensive plans. This process allows for corrections to basic problems in the street system layout and design.

To qualify for community development funds or discretionary funds for urban renewal, a city must first prepare a community development program. Urban areas compete throughout the State on the basis of demographic points which consider such conditions as percent of substandard housing, people per square feet of housing, dwelling unit age, etc. An effort can be made to ensure that community development and transportation plans are compatible.

Capital Improvements Program

One of the tools which makes it easier to build a planned thoroughfare system is a Capital Improvements Program. This is a long range plan for the spending of money on street improvements, acquisition of right-of-way, and other capital improvements within the bounds of projected revenues. Municipal funds should be available for construction of street improvements which are a municipal responsibility, right-of-way cost sharing on facilities designated as Division of Highways responsibility, and advance purchase of right-of-way where such action is required.

The section of the Capital Improvements Program which deals with the Thoroughfare Plan requires a fairly detailed knowledge of the costs of various projects. This program could be used to benefit any of the improvements listed in this plan.

Development Reviews

Driveway access to a State-maintained street or highway is reviewed by the District Engineer's office and by the Traffic Engineering Branch of the North Carolina Department of Transportation prior to access being allowed. Any development expected to generate large volumes (i.e. shopping centers, fast food restaurants, large industries, etc.) may be comprehensively studied by staff from the Traffic Engineering, Statewide Planning, and Roadway Design Branches of NC DOT. If done at an early stage, it is often possible to significantly improve the development's accessibility at minimal expense. Since the municipality is the first point of contact for developers, it is important that the municipality advise them of this review requirement and cooperate in the review process.

Other Funding Sources

1. Assess user impact fees to fund transportation projects. These fees, called "facility fees" in the legislation, are to be based upon "reasonable and uniform considerations of capital costs to be incurred by the town as a result of new construction. The facility fee must bear a direct relationship to additional or expanded public capital costs of the community service facilities to be rendered for the inhabitants, occupants of the new construction, or those associated with the development process."

2. Enact a bond issue to fund street improvements.

3. Have project included in the North Carolina Transportation Improvement Program (TIP). North Carolina's TIP is a document which lists all major construction projects the Department of Transportation plans for the next seven years. Similar to local Capital Improvement Program Projects, TIP projects are matched with projected funding sources. Each year when the TIP is updated, completed projects are removed, programed projects are advanced, and new projects are added.

   During annual TIP public hearings, requests are made to have projects included in the TIP. A Board of Transportation member, Division Engineer, and DOT Staff review all of the project requests in a particular area of the State. Based on the technical feasibility, need, and available funding, it is decided which projects will be included in the TIP. In addition to highway construction and widening, TIP funds are available for bridge replacement projects, highway safety projects, public transit projects, railroad projects, and bicycle projects.

4. Consider the possibility of specific projects qualifying for federal demonstration project funds.

5. Adopt a collector street plan that would assess buyer or property owners for street improvements.

6. Industrial Access Funds. If an industry wishes to develop property that does not have access to a state maintained highway and certain economic conditions are met, then funds may be made available for construction of an access road.

7. Small Urban Funds. Small Urban funds are annual discretionary funds made to municipalities with qualifying projects. The maximum amount is $300,000 per year per project. A town may have multiple projects. Requests for Small Urban Fund assistance should be directed to the appropriate Board of Transportation member and Division Engineer.

TABLE 9-1

FUNDING SOURCES & METHODS RECOMMENDED FOR IMPLEMENTATION OF PROJECTS									
PROJECT	FUNDING SOURCES				METHODS OF IMPLEMENTATION				
	Local Funds	TIP Funds	Indust. Access	Small Urban	T-fare Plan	Subdiv. Ord.	Zoning Ord.	Future Street Lines	Development Review
US 17 Widening		X			X				
NC 53 Bypass		X			X	X	X		
US 117 Widening		X			X		X		X
US 17 Bypass		X			X	X	X		X
NC 50 Widening		X			X				X
NC 53 Widening		X			X				X

APPENDIX A

TYPICAL THOROUGHFARE CROSS SECTIONS

Cross section requirements for thoroughfares vary according to the desired capacity and level of service to be provided. Universal standards in the design of thoroughfares are not practical. Each street section must be individually analyzed and its cross section requirements determined on the basis of amount and type of projected traffic, existing capacity, desired level of service, and available right-of-way.

Typical cross section recommendations are shown in Figure **A1**. These cross sections are typical for facilities on new location and where right-of-way constraints are not critical. For widening projects and urban projects with limited right-of-way, special cross sections should be developed that meet the needs of the project.

Recommended typical cross sections for thoroughfares were derived on the basis of projected traffic, existing capacities, desirable levels of service, and available right-of-way. The recommended typical cross sections for the thoroughfares are given in Appendix **A** along with other pertinent information.

On all existing and proposed major thoroughfares delineated on the thoroughfare plan, adequate right-of-way should be protected or acquired for the ultimate cross sections. Ultimate desirable cross sections for each of the thoroughfares are listed in Appendix **A** . Recommendations for "ultimate" cross sections are provided for (1) thoroughfares which may require widening after the current planning period; (2) for thoroughfares which are borderline adequate and accelerated traffic growth could render them deficient; and (3) for thoroughfares where an urban curb and gutter cross section may be locally desirable because of urban development or redevelopment.

Recommended design standards relating to maximum and minimum grades, minimum sight distances, maximum degree of curve and related super elevation, and other considerations for thoroughfares are given in Appendix **B** . This Appendix gives definitions and design standards recommended for inclusion in subdivision regulations.

Cross sections "A" and "L" are typical for controlled access freeways. The 14 m (46 ft) grassed median is the minimum desirable median width, but there could be some variation from this depending upon design considerations. Right-of-way requirements would typically vary upward from 70 m (228 ft) depending upon cut and fill requirements.

Cross section "B", seven lane curb and gutter, should not be used for new projects. When the conditions warrant six lanes, cross section "D" should be recommended. Cross section "B" should be used only in special situations such as when widening from a five lane section and right-of-way is limited. Even in these situations, consideration should be given to converting the center turn lane to a median so that cross section "D" is the final cross section.

Cross section "C", five lane curb and gutter, is typical for major thoroughfares where frequent left turns are anticipated as a result of abutting development or frequent street intersections.

Cross sections "D", "E", and "M" are used on major thoroughfares where left turns and intersecting streets are not as frequent. Left turns would be restricted to a few selected intersections. The 4.9 m (16 ft) median is the minimum recommended for an urban boulevard type cross section. In most instances, monolithic construction should be utilized due to greater cost effectiveness, ease and speed of placement, and reduced future maintenance requirements. In special cases, grassed or landscaped medians may be used in urban areas. However, these types of medians result in greatly increased maintenance costs and an increased danger to maintenance personnel. Non-monolithic medians should only be recommended when the above concerns are addressed.

Cross section "F" is recommended for urban boulevards or parkways to enhance the urban environment and to improve the compatibility of major thoroughfares with residential areas. A minimum median width of 7.3 m (24 ft) is recommended with 9.1 m (30 ft) being desirable.

Typical cross section "G" is recommended for major thoroughfares where projected travel indicates a need for four travel lanes but traffic is not excessively high, left turning movements are light, and right-of-way is restricted. An additional left turn lane would probably be required at major intersections. This cross section should be used only if the above criteria is met. If right-of-way is not restricted, future strip development could take place and the inner lanes could become de facto left turn lanes.

In urban environments, thoroughfares which are proposed to function as one-way traffic carriers would typically require **cross section "H"**. **Cross sections "I" and "J"** are usually recommended for urban minor thoroughfares since these facilities usually serve both land service and traffic service functions. **Cross section "I"** would be used on those minor thoroughfares where parking on both sides is needed as a result of more intense development.

Cross section "K" is used in rural areas or for staged construction of a wider multi-lane cross section.

On some thoroughfares, projected traffic volumes may indicate that two travel lanes will adequately serve travel for a considerable period of time. For areas that are growing and future widening will be necessary, the full right-of-way of 30 m (100 ft) should be required. In some instances, local ordinances may not allow the full 30 m (100 ft). In those cases, 21 m (70 ft) should be preserved with the understanding that the full 30 m (100 ft) will be preserved by use of building setbacks and future street line ordinances.

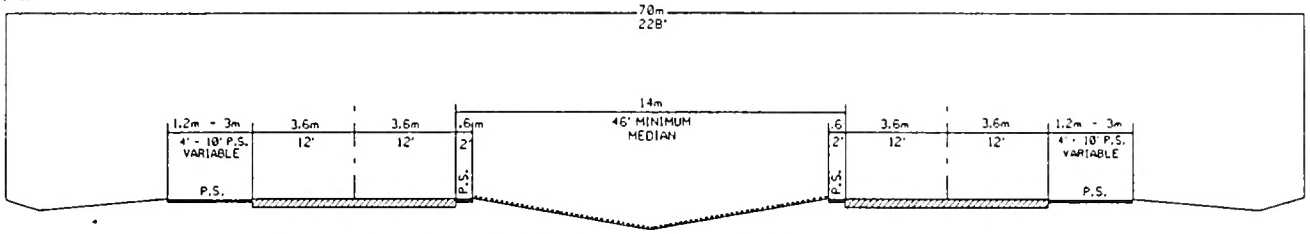
The urban curb and gutter cross sections all illustrate the sidewalk adjacent to the curb with a buffer or utility strip between the sidewalk and the minimum right-of-way line. This permits adequate setback for utility poles. If it is desired to move the sidewalk farther away from the street to provide additional separation for pedestrians or for aesthetic reasons, additional right-of-way must be provided to insure adequate setback for utility poles.

The right-of-ways shown for the typical cross sections are the minimum rights-of-way required to contain the street, sidewalks, utilities, and drainage facilities. Cut and fill requirements may require either additional right-of-way or construction easements. Obtaining construction easements is becoming the more common practice for urban thoroughfare construction.

If there is sufficient bicycle travel along the thoroughfare to justify a bicycle lane or bikeway, additional right-of-way may be required to contain the bicycle facilities. The North Carolina Bicycle Facilities Planning and Design Guidelines should be consulted for design standards for bicycle facilities. **Cross sections N, O, and P** are typically used to accommodate bicycle travel.

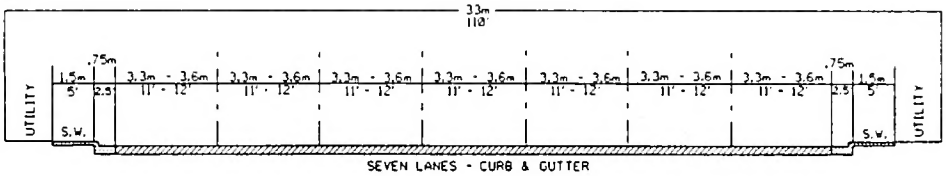
TYPICAL THOROUGHFARE CROSS SECTIONS

A.



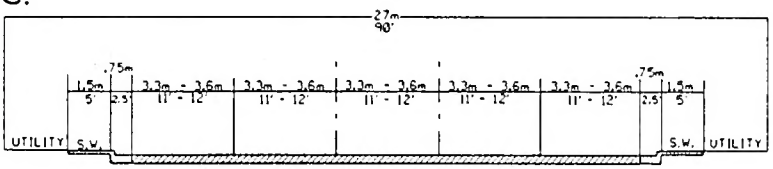
FOUR LANES DIVIDED WITH MEDIAN - FREEWAY

B.



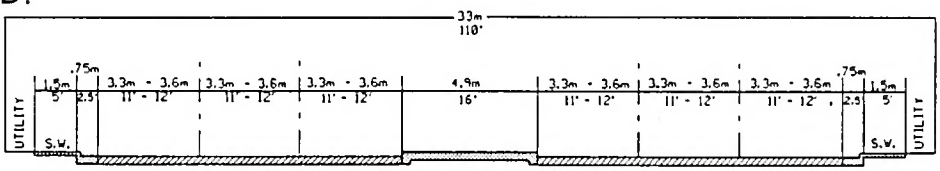
SEVEN LANES - CURB & GUTTER

C.



FIVE LANES - CURB & GUTTER

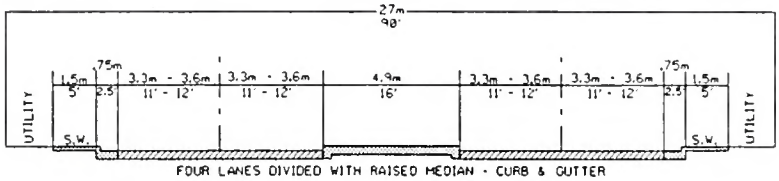
D.



SIX LANES DIVIDED WITH RAISED MEDIAN - CURB & GUTTER

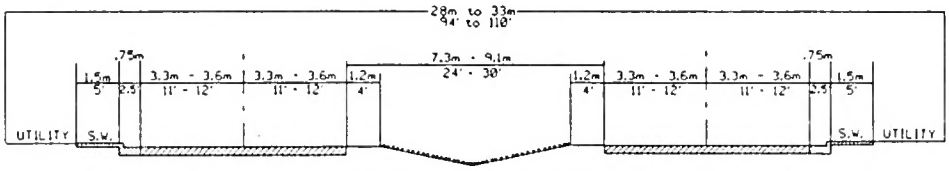
TYPICAL THOROUGHFARE CROSS SECTIONS

E.



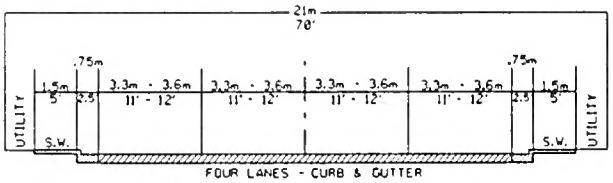
FOUR LANES DIVIDED WITH RAISED MEDIAN - CURB & GUTTER

F.



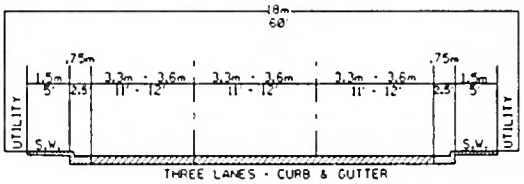
FOUR LANES DIVIDED - BOULEVARD
GRASS MEDIAN

G.



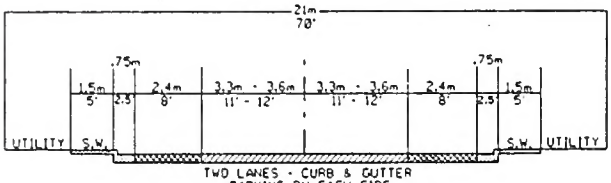
FOUR LANES - CURB & GUTTER

H.



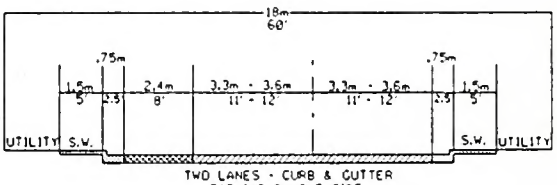
THREE LANES - CURB & GUTTER

I.



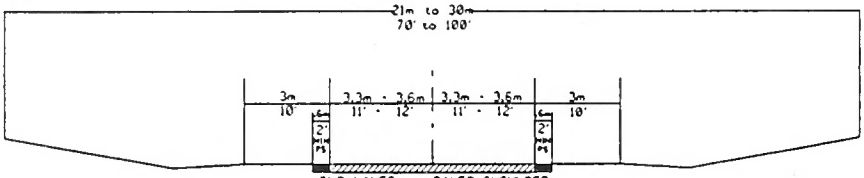
TWO LANES - CURB & GUTTER
PARKING ON EACH SIDE

J.



TWO LANES - CURB & GUTTER
PARKING ON ONE SIDE

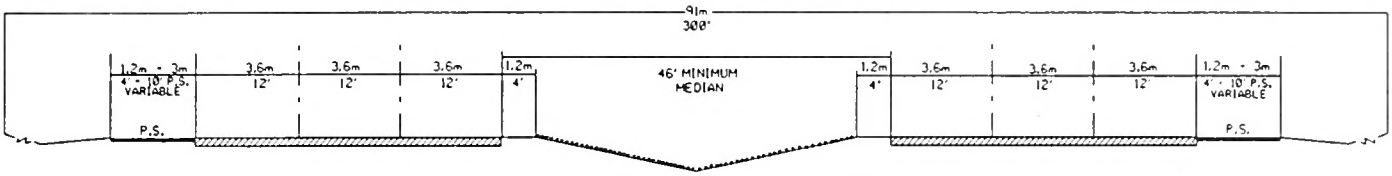
K.



TWO LANES - PAVED SHOULDER

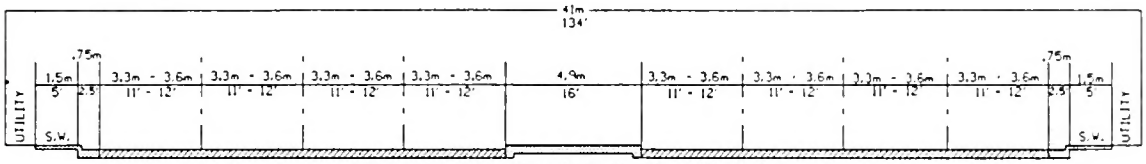
TYPICAL THOROUGHFARE CROSS SECTIONS

L.



SIX LANES DIVIDED WITH GRASS MEDIAN - FREEWAY

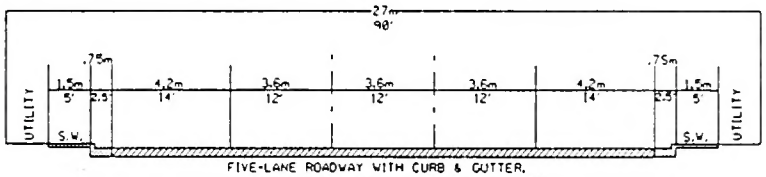
M.



EIGHT LANES DIVIDED WITH RAISED MEDIAN - CURB & GUTTER

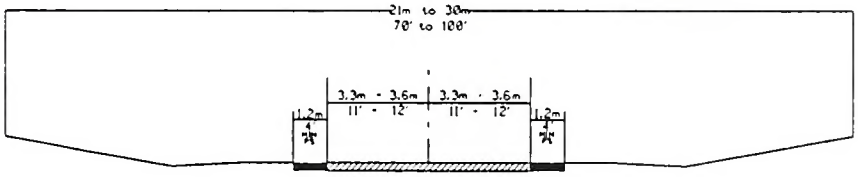
TYPICAL THOROUGHFARE CROSS SECTIONS FOR ACCOMMODATING BICYCLES

N.



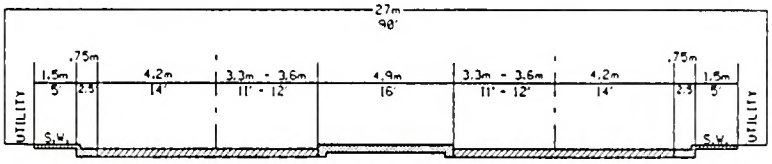
FIVE-LANE ROADWAY WITH CURB & GUTTER.
STANDARD INSIDE LANES & WIDENED CURB LANES

O.



TWO LANES - SHOULDER SECTION

P.



FOUR LANES DIVIDED WITH RAISED MEDIAN - CURB & GUTTER.
STANDARD INSIDE LANES & WIDENED CURB LANES

TABLE A1
PENDER COUNTY
THOROUGHFARE PLAN STREET TABULATION AND RECOMMENDATIONS

The Street Tabulation and Recommendations on the following pages consist of a listing of roads in the County, base year and future year traffic volumes, and recommended cross sections for each facility.

Key to abbreviations:

6L	Six lanes
A through P	Refer to thoroughfare cross sections, Figure A-1
ADQ	Adequate existing situation
ADT	Average Daily Traffic, measured in vehicles per day
BRG	Bridge
CAPACITY	Volume of traffic a roadway can handle at Level of Service D
DIST	Distance along section of roadway, measured in meters
E, N, S, W	East, north, south, or west
ECL, NCL, SCL, WCL	Eastern, northern, southern, or western city limits
NPL, EPL, SPL, WPL	Northern, eastern, southern, western planning limits
FT	Feet
MI	Miles
KM	Kilometers (1 KM = .62 Mile)
M	Meters
N/A	Not available
PB	Thoroughfare planning boundary
RDWY	Roadway width, measured in feet
ROW	Right-of-way width, measured in feet
RR XING	Railroad crossing
SR	Secondary road number
ULT	Ultimate
UN	Unpaved roadway
VPD	Vehicles per day

SECONDARY ROADS INCLUDED IN THOROUGHFARE PLAN AND CORRESPONDING ROAD NUMBER

ROAD NUMBER	ROAD NAME
SR 1001	Willard Road
SR 1002	Island Creek Road
SR 1120	Malpass Corner Road
SR 1121	Bell Williams Road
SR 1128	Point Caswell Road
SR 1201	Baetty's Bridge Road
SR 1209	Shiloh Road
SR 1216	Piney Woods Road
SR 1305	Doctors Creek Road
SR 1332	Penderlea Highway
SR 1336	Horse Branch Road
SR 1347	Old Savannah Road
SR 1400	Highsmith Road
SR 1412	New Road
SR 1414	St. Helena - Stokley Road
SR 1533	Shepards Road
SR 1572	Sidbury Road

THOROUGHFARE PLAN STREET TABULATION AND RECOMMENDATIONS

FACILITY AND SECTION	EXISTING CROSS-SECTION METRIC DIST KM	RDWY M	ROW M	ENGLISH DIST MI	RDWY (FT)	ROW (FT)	PRACTICAL CAPACITY CURRENT (FUTURE)	1994 ADT	2020 (VPD)	RECOMMENDED X-SECTION METRIC (m) RDWY (ULT)	ROW (ULT)	ENGLISH (ft) RDWY (UTL)	ROW (ULT)
I-40	41.9	14.4	98	26.0	48	320	52700	15600	35600	ADQ	ADQ	ADQ	ADQ
US 17 Bypass	12.4	N/A	N/A	7.8	N/A	N/A	(40000)	N/A	14000	F	37	F	120
US 17													
New Hanover Co. - NC 210	6.9	9.9	30	4.3	33	100	(40000)	12700	27400	F	ADQ	F	ADQ
NC 210 - SR 1675	4.2	9.9	30	2.6	33	100	(30000)	15500	33400	C	ADQ	C	ADQ
SR 1675 - Hillview St.	4.4	9.9	30	2.7	33	100	(30000)	10300	22200	C	ADQ	C	ADQ
Hillview St. - Onslow Co.	7.3	9.9	30	4.5	33	100	(40000)	9200	19800	F	ADQ	F	ADQ
US 117													
Duplin Co. - I-40	4.4	7.2	46	2.7	24	150	13000	4700	11500	ADQ	ADQ	ADQ	ADQ
I-40 -SR 1502	5.0	7.2	46	3.1	24	150	12500	2600	6400	ADQ	ADQ	ADQ	ADQ
SR 1502 - SR 1318	1.1	7.2	46	0.7	24	150	12500	1700	4200	ADQ	ADQ	ADQ	ADQ
SR 1318 - Burgaw NPL	5.3	7.2	46	3.3	24	150	12500	2300	5600	ADQ	ADQ	ADQ	ADQ
Burgaw SPL - SR 1411	6.3	7.2	46	3.9	24	150	(40000)	6400	15700	F	ADQ	F	ADQ
SR 1411 - SR 1433	1.6	7.2	46	1.0	24	150	(40000)	6100	14900	F	ADQ	F	ADQ
SR 1433 - NC 210	2.7	7.2	46	1.7	24	150	(40000)	7200	17600	F	ADQ	F	ADQ
NC 210 - New Hanover Co.	8.7	7.2	61	5.4	24	200	(40000)	5400	13200	F	ADQ	F	ADQ
US 421													
Sampson Co. - NC 11	6.1	9.6	30	3.8	32	100	12100	2300	5600	ADQ	ADQ	ADQ	ADQ
NC 11 - SR 1209	4.0	9.6	30	2.5	32	100	12100	3200	7800	ADQ	ADQ	ADQ	ADQ
SR 1209 - NC 11/53	8.4	9.6	30	5.2	32	100	12100	2900	7100	ADQ	ADQ	ADQ	ADQ
NC 11/53 - NC 210	8.9	14.4	85	5.5	48	280	40000	3600	8800	ADQ	ADQ	ADQ	ADQ
NC 210 - New Hanover Co.	14.5	14.4	85	9.0	48	280	40000	4200	10300	ADQ	ADQ	ADQ	ADQ
NC 11													
US 421 - SR 1328	5.6	6.6	18	3.5	22	60	11200	1200	2600	ADQ	ADQ	ADQ	ADQ
SR 1328 - SR 1001	5.9	6.6	18	3.6	22	60	11200	2200	4700	ADQ	ADQ	ADQ	ADQ
SR 1001 - US 117	4.0	6.6	18	2.5	22	60	11200	900	1900	ADQ	ADQ	ADQ	ADQ
NC 11/53													
Bladen Co. - US 421	16.3	6.6	18	10.1	22	60	11600	2600	5600	ADQ	ADQ	ADQ	ADQ
NC 50													
Duplin Co. - NC 53	7.7	6.6	18	4.8	22	60	11400	1400	3900	ADQ	ADQ	ADQ	ADQ
NC 53 - Onslow Co.	8.4	6.6	18	5.2	22	60	(40000)	2000	5500	(F)	(37)	(F)	(120)
Onslow Co. - NC 210	2.3	6.6	18	1.4	22	60	(40000)	4000	8600	(F)	(37)	(F)	(120)
NC 210 - 0.1mi. S. Of Bridge	1.8	6.6	18	1.1	22	60	(20700)	7000	15100	H	21	H	70
0.1mi. S. of Bridge- NC 210/50	2.9	6.6	18	1.8	22	60	(20700)	7000	15100	H	21	H	70

KEY TO ABBREVIATIONS ON PAGE A-9

THOROUGHFARE PLAN STREET TABULATION AND RECOMMENDATIONS

FACILITY AND SECTION		EXISTING CROSS-SECTION METRIC DIST KM	RDWY M	ROW M	ENGLISH DIST MI	RDWY (FT)	ROW (FT)	PRACTICAL CAPACITY CURRENT (FUTURE)	1994 ADT	2020 (VPD)	RECOMMENDED X-SECTION METRIC RDWY (ULT)	(m) ROW (ULT)	ENGLISH RDWY (UTL)	(ft) ROW (ULT)
NC 53 Bypass														
	Burgaw Thoroughfare Plan	9.2	N/A	N/A	5.7	N/A	N/A	(13600)	N/A	7000	K	30	K	100
NC 53														
	Wards Corner-Burgaw WPL	7.6	6.6	18	4.7	22	60	(13600)	2100	4500	K	ADQ	K	ADQ
	Burgaw EPL-NE Cape Fear	2.4	6.6	18	1.5	22	60	(40000)	2800	7800	(F)	(37)	(F)	(120)
	NE Cape Fear-NC 50	18.1	6.6	30	11.2	22	100	(40000)	2800	7800	(F)	(37)	(F)	(120)
	NC 50-Onslow County	5.0	6.6	30	3.1	22	100	(13600)	2000	5500	K	ADQ	K	ADQ
NC 133														
	SR 1409 - US 117	7.7	6.6	18	4.8	22	60	(13600)	2800	6000	K	ADQ	K	ADQ
NC 210														
	Bladen Co. - SR 1120	7.3	5.4	18	4.5	18	60	(11700)	1200	2600	K	ADQ	K	ADQ
	SR 1120 - US 421	10.2	7.2	18	6.3	24	60	11700	1200	2600	ADQ	ADQ	ADQ	ADQ
	US 412 - SR 1404	3.9	6.6	18	2.4	22	60	(11700)	2900	6300	K	ADQ	K	ADQ
	SR 1404 - SR 1409	6.3	6.6	18	3.9	22	60	(11700)	1100	2400	K	ADQ	K	ADQ
	SR 1409 - SR 1002	23.1	7.2	18	14.3	24	60	11700	2500	5500	ADQ	ADQ	ADQ	ADQ
	SR 1002 - US 17/ NC 210	6.1	7.2	18	3.8	24	60	11700	3100	7600	ADQ	ADQ	ADQ	ADQ
	US 17/ NC 210- NC 50	18.7	7.2	18	11.6	24	60	11700	4500	9700	ADQ	ADQ	ADQ	ADQ
SR 1001	(WILLARD RD)													
	Sampson Co. - SR 1305	5.2	5.4	18	3.2	18	60	(10500)	600	1300	6.0	ADQ	20	ADQ
	SR 1305 - SR 1307	4.0	5.4	18	2.5	18	60	(10500)	800	1700	6.0	ADQ	20	ADQ
	SR 1307 - US 117	8.4	5.4	18	5.2	18	60	(10500)	800	1700	6.0	ADQ	20	ADQ
SR 1002	(ISLAND CREEK RD)													
	New Hanover CO. - NC 210	4.5	7.2	18	2.8	24	60	12900	1300	2800	ADQ	ADQ	ADQ	ADQ
SR 1120	(MALPASS CORNER RD)													
	SR 1121 - SR 1118	2.4	5.4	N/A	1.5	18	N/A	(12000)	700	1500	6.6	18	22	60
	SR 1118 - US 421	5.0	5.4	N/A	3.1	18	N/A	(12000)	900	1900	6.6	18	22	60
	US 421 - Burgaw WPL	6.8	5.4	N/A	4.2	18	N/A	(12000)	1400	3000	6.6	18	22	60
SR 1121	(BELL-WILLIAMS RD)													
	NC 11 - NC 11/53	3.9	5.4	N/A	2.4	18	N/A	(10300)	400	900	6.0	18	20	60
	NC 11/53 - Yamacraw	2.6	5.4	N/A	1.6	18	N/A	(10300)	900	1900	6.0	18	20	60
SR 1128	(POINT CASWELL)													
	NC 11(Coston) - SR 1207	2.9	5.4	N/A	1.8	18	N/A	(10500)	400	800	6.0	18	20	60
	SR 1207 - Murphy Cross	2.6	5.4	N/A	1.6	18	N/A	(10500)	800	1700	6.0	18	20	60

KEY TO ABBREVIATIONS ON PAGE A-9

THOROUGHFARE PLAN STREET TABULATION AND RECOMMENDATIONS

FACILITY AND SECTION		EXISTING CROSS-SECTION METRIC DIST KM	RDWY M	ROW M	ENGLISH DIST MI	RDWY (FT)	ROW (FT)	PRACTICAL CAPACITY CURRENT (FUTURE)	1994 ADT	2020 (VPD)	RECOMMENDED X-SECTION METRIC (m) RDWY (ULT)	ROW (ULT)	ENGLISH (ft) RDWY (UTL)	ROW (ULT)
SR 1201	(BEATTY'S BRIDGE RD)													
	Bladen Co. - Atkinson	8.9	5.4	N/A	5.5	18	N/A	(10500)	600	1300	6.0	18	20	60
SR 1209	(SHILOH RD)													
	Sampson Co. - US 421	8.5	5.4	N/A	5.3	18	N/A	(10500)	500	1000	6.0	18	20	60
	US 421 - SR 1332	8.9	5.4	N/A	5.5	18	N/A	(10500)	400	800	6.0	18	20	60
SR 1216	(PINEY WOODS RD)													
	SR 1128 - Piney Woods (NC 11)	2.3	5.4	18	1.4	18	60	(10900)	600	1200	6.0	ADQ	20	ADQ
	Piney Woods (NC 11) - SR 1336	8.5	5.4	18	5.3	18	60	(10900)	700	1400	6.0	ADQ	20	ADQ
	SR 1336 - Burgaw WPL	1.9	5.4	18	1.2	18	60	(10900)	700	1500	6.0	ADQ	20	ADQ
SR 1305	(DOCTORS CREEK RD)													
	Duplin Co. - SR 1001	1.3	6.0	18	0.8	20	60	9600	400	900	ADQ	ADQ	ADQ	ADQ
SR 1332	(PENDERLEA HWY)													
	NC 11 - SR 1209	4.5	6.0	N/A	2.8	20	N/A	(12000)	1000	2200	6.6	18	22	60
	SR 1209 - SR 1336	5.6	6.0	N/A	3.5	20	N/A	(12000)	1400	3000	6.6	18	22	60
	SR 1336 - Burgaw NPL	1.5	6.0	N/A	0.9	20	N/A	(12000)	1600	3500	6.6	18	22	60
SR 1336	(HORSE BRANCH RD)													
	Watha City Limits - SR 1332	7.3	6.0	N/A	4.5	20	N/A	9500	500	1100	ADQ	ADQ	ADQ	ADQ
	SR 1332 - SR 1216	3.9	6.0	N/A	2.4	20	N/A	9500	600	1200	ADQ	ADQ	ADQ	ADQ
	SR 1216 - NC 53	1.3	6.0	N/A	0.8	20	N/A	(11400)	1000	2000	6.6	ADQ	22	ADQ
	NC 53 - SR 1120	1.9	6.0	N/A	1.2	20	N/A	9500	500	1000	ADQ	ADQ	ADQ	ADQ
SR 1347	(OLD SAVANNAH RD)													
	SR 1345 - US 117	1.8	6.0	60	1.1	20	60	10900	100	200	ADQ	ADQ	ADQ	ADQ
SR 1400	(HIGHSMITH RD)													
	Burgaw SPL - NC 210	12.6	6.0	N/A	7.8	20	N/A	10900	800	1700	ADQ	18	ADQ	60
SR 1412	(NEW ROAD)													
	Burgaw SPL - US 117	4.2	5.4	N/A	2.6	18	N/A	(11400)	1000	2200	6.6	18	22	60
SR 1414	(ST HELENA - STOKLEY)													
	SR 1400 - SR 1412	2.3	5.4	18	1.4	18	60	(10300)	900	1900	6.0	ADQ	20	ADQ
	SR 1412 - US 117	1.1	5.4	N/A	0.7	18	N/A	(10300)	900	1900	6.0	18	20	60
SR 1533	(SHEPARDS RD)													
	US 17 - NC 50	1.9	6.0	N/A	1.2	20	N/A	10900	700	1500	ADQ	18	ADQ	60
SR 1572														
	NEW HANOVER CO - US17	3.7	6.0	24	2.3	20	80	(11400)	1800	3900	6.6	ADQ	22	ADQ

KEY TO ABBREVIATIONS ON PAGE A-9

Appendix B

RECOMMENDED SUBDIVISION ORDINANCES

Note: English equivalents are printed in this report merely as a guide. The English measurements were not meant to represent exact conversions, and should not be used for standards, regulations, or construction. The tables in this section were taken from the Roadway Design Metric Design Manual. In the event of conflicting information, the Standard Specifications for Roads and Structures and the Roadway Design Metric Design Manual should serve as the standard.

Appendix B

RECOMMENDED SUBDIVISION ORDINANCES

DEFINITIONS

I. Streets and Roads

A. Rural Roads

1. Principal Arterial - A rural link in a highway system serving travel, and having characteristics indicative of substantial statewide or interstate travel and existing solely to serve traffic. This network would consist of Interstate routes and other routes designated as principal arterials.

2. Minor Arterial - A rural roadway joining cities and larger towns and providing intra-state and inter-county service at relatively high overall travel speeds with minimum interference to through movement.

3. Major Collector - A road which serves major intra-county travel corridors and traffic generators and provides access to the Arterial system.

4. Minor Collector - A road which provides service to small local communities and traffic generators and provides access to the Major Collector system.

5. Local Road - A road which serves primarily to provide access to adjacent land, over relatively short distances.

B. Urban Streets

1. Major Thoroughfares - Major thoroughfares consist of Inter-state, other freeway, expressway, or parkway roads, and major streets that provide for the expeditious movement of high volumes of traffic within and through urban areas.

2. Minor Thoroughfares - Minor thoroughfares perform the function of collecting traffic from local access streets and carrying it to the major thoroughfare system. Minor thoroughfares may be used to supplement the major thoroughfare system by facilitating minor through traffic movements and may also serve abutting property.

3. Local Street - A local street is any street not on a higher order urban system and serves primarily to provide direct access to abutting land.

C. Specific Type Rural or Urban Streets

1. Freeway, expressway, or parkway - Divided multilane roadways designed to carry large volumes of traffic at high speeds. A freeway provides for continuous flow of vehicles with no direct access to abutting property and with access to selected crossroads only by way of interchanges. An expressway is a facility with full or partial control of access and generally with grade separations at major intersections. A parkway is for non-commercial traffic, with full or partial control of access.

2. Residential Collector Street - A local street which serves as a connector street between local residential streets and the thoroughfare system. Residential collector streets typically collect traffic from 100 to 400 dwelling units.

3. Local Residential Street - Cul-de-sacs, loop streets less than 760 meters (2500 ft) in length, or streets less than 1.6 kilometers (1.0 miles) in length that do not connect thoroughfares, or serve major traffic generators, and do not collect traffic from more than 100 dwelling units.

4. Cul-de-sac - A short street having only one end open to traffic and the other end being permanently terminated and a vehicular turn-around provided.

5. Frontage Road - A road that is parallel to a partial or full access controlled facility and provides access to adjacent land.

6. Alley - A strip of land, owned publicly or privately, set aside primarily for vehicular service access to the back side of properties otherwise abutting on a street.

II. Property

A. Building Setback Line - A line parallel to the street in front of which no structure shall be erected.

B. Easement - A grant by the property owner for use by the public, a corporation, or person(s), of a strip of land for a specific purpose.

C. Lot - A portion of a subdivision, or any other parcel of land, which is intended as a unit for transfer of ownership or for development or both. The word "lot" includes the words "plat" and "parcel".

III. Subdivision

A. Subdivider - Any person, firm, corporation or official agent thereof, who subdivides of develops any land deemed to be a subdivision.

B. Subdivision - All divisions of a tract or parcel of land into two or more lots, building sites, or other divisions for the purpose, immediate or future, of sale or building development and all divisions of land involving the dedication of a new street or change in existing streets; provided, however, that the following shall not be included within this definition nor subject to these regulations: (1) the combination or re-combination of portions of previously platted lots where the total number of lots is not increased and the resultant lots are equal to or exceed the standards contained herein; (2) the division of land into parcels greater than 4 hectares (10 acres) where no street right-of-way dedication is involved, (3) the public acquisition, by purchase, of strips of land for the widening or the opening of streets; (4) the division of a tract in single ownership whose entire area is no greater than 0.8 hectares (2 acres) into not more than three lots, where no street right-of-way dedication is involved and where the resultant lots are equal to or exceed the standards contained herein.

C. Dedication - A gift, by the owner, of his property to another party without any consideration being given for the transfer. The dedication is made by written instrument and is completed with an acceptance.

D. Reservation - Reservation of land does not involve any transfer of property rights. It constitutes an obligation to keep property free from development for a stated period of time.

DESIGN STANDARDS

I. Streets and Roads

The design of all roads within the Planning Area shall be in accordance with the accepted policies of the North Carolina Department of Transportation, Division of Highways, as taken or modified from the American Association of State Highway Officials' (AASHTO) manuals.

The provision of street rights-of-way shall conform and meet the recommendations of the Thoroughfare Plan, as adopted by the municipality.

The proposed street layout shall be coordinated with the existing street system of the surrounding area. Normally the proposed streets should be the extension of existing streets if possible.

A. Right-of-way Widths - Right-of-way (ROW) widths shall not be less than the following and shall apply except in those cases where ROW requirements have been specifically set out in the Thoroughfare Plan.

	Min. ROW	
1. Rural		
a. Principle Arterial		
Freeways	105 m	(350 ft)
Other	60 m	(200 ft)
b. Minor Arterial	30 m	(100 ft)
c. Major Collector	30 m	(100 ft)
d. Minor Collector	24 m	(80 ft)
e. Local Road	18 m[1]	(60 ft)
2. Urban		
a. Major Thoroughfare other than Freeway and Expressway	27 m	(90 ft)
b. Minor Thoroughfare	21 m	(70 ft)
c. Local Street	18 m[1]	(60 ft)
d. Cul-de-sac	Variable[2]	

The subdivider will only be required to dedicate a maximum of 30 meters (100 ft) of right-of-way. In cases where over 30 meters (100 ft) of right-of-way is desired, the subdivider will be required only to reserve the amount in excess of 30 meters (100 ft). On all cases in which right-of-way is sought for a fully controlled access facility, the subdivider will only be required to make a reservation. It is strongly recommended that subdivisions provide access to properties from internal streets, and that direct property access to major thoroughfares, principle and minor arterials, and major collectors be avoided. Direct property access to minor thoroughfares is also undesirable.

A partial width right-of-way, not less than 18 meters (60 ft) in width, may be dedicated when

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[1] The desirable minimum right-of-way (ROW) is 18 meters (60 ft). If curb and gutter is provided, 15 meters (50 ft) of ROW is adequate on local residential streets.

[2] The ROW dimension will depend on radius used for vehicular turn around. Distance from edge of pavement of turn around to ROW should not be less than distance from edge of pavement to ROW on street approaching turn around.

adjoining undeveloped property that is owned or controlled by the subdivider; provided that the width of a partial dedication be such as to permit the installation of such facilities as may be necessary to serve abutting lots. When the said adjoining property is sub-divided, the remainder of the full required right-of-way shall be dedicated.

B. Street Widths - Widths for street and road classifications other than local shall be as recommended by the Thoroughfare Plan. Width of local roads and streets shall be as follows:

1. Local Residential
   Curb and Gutter section: 7.8 meters (26 ft), face to face of curb
   Shoulder section: 6.0 meters (20 ft) to edge of pavement, 1.2 meters (4 ft) for shoulders

2. Residential Collector
   Curb and Gutter section: 10.2 meters (34 ft), face to face of curb
   Shoulder section: 6.0 meters (20 ft) to edge of pavement, 1.8 meters (6 ft) for shoulders

C. Geometric Characteristics - The standards outlined below shall apply to all subdivision streets proposed for addition to the State Highway System or Municipal Street System. In cases where a subdivision is sought adjacent to a proposed thoroughfare corridor, the requirements of dedication and reservation discussed under Right-of-Way shall apply.

1. Design Speed - The design speed for a roadway should be a minimum of 10 km/h (5 mph) greater than the posted speed limit. The design speeds for subdivision type streets shall be:

DESIGN SPEEDS (METRIC)			
Facility Type	Design Speed km/h		
	Desirable	Minimum	
		Level	Rolling
RURAL			
Minor Collector Roads (ADT Over 2000)	100	80	60
Local roads including Residential Collectors and Local Residential (ADT Over 400)	80	80	60
URBAN			
Major Thoroughfares other than Freeway or Expressway	100	60	60
Minor Thoroughfares	100	50	50
Local Streets	50	50	30

DESIGN SPEEDS (ENGLISH)			
Facility Type	Design Speed mph		
	Desirable	Minimum	
		Level	Rolling
RURAL			
Minor Collector Roads (ADT Over 2000)	60	50	40
Local roads including Residential Collectors and Local Residential (ADT Over 400)	50	* 50	* 40
URBAN			
Major Thoroughfares other than Freeway or Expressway	60	50	40
Minor Thoroughfares	40	30	30
Local Streets	30	**30	**20

* Based on ADT of 400-750. Where roads serve a limited area and small number of units, can reduce min design speed.

**Based on projected ADT of 50-250.
(Reference NCDOT Metric Design Manual page 1-1B)

2. Maximum and Minimum Grades

a. The maximum grades in percent shall be:

MAXIMUM VERTICAL GRADE (METRIC)				
Facility Type	Design Speed (km/h)	Maximum Grade (Percent) Flat	Rolling	Mountainous
RURAL				
Minor Collector Roads*	30	7	10	12
	50	7	9	10
	65	7	8	10
	80	6	7	9
	100	5	6	8
	110	4	5	6
Local roads including Residential Collectors and Local Residential Streets*	30	-	11	16
	50	7	10	14
	65	7	9	12
	80	6	8	10
	100	5	6	-
URBAN				
Major Thoroughfares other than Freeway or Expressway	50	8	9	11
	65	7	8	10
	80	6	7	9
	100	5	6	8
Minor Thoroughfares*	30	9	12	14
	50	9	11	12
	65	9	10	12
	80	7	8	10
	100	6	7	9
	110	5	6	7
Local Streets*	30	-	11	16
	50	7	10	14
	65	7	9	12
	80	6	8	10
	100	5	6	-

* For streets and roads with projected annual average daily traffic less than 250 or short grades less than 150 meters (500 ft) long, grades may be 2% steeper than the values in the above table.

(Reference NCDOT Metric Design Manual page 1-12 T-3)

MAXIMUM VERTICAL GRADE (ENGLISH)				
Facility Type	Design Speed (mph)	Maximum Grade (Percent) Flat	Rolling	Mountainous
RURAL				
Minor Collector Roads*	20	7	10	12
	30	7	9	10
	40	7	8	10
	50	6	7	9
	60	5	6	8
	70	4	5	6
Local roads including Residential Collectors and Local Residential Streets*	20	-	11	16
	30	7	10	14
	40	7	9	12
	50	6	8	10
	60	5	6	-
URBAN				
Major Thoroughfares other than Freeway or Expressway	30	8	9	11
	40	7	8	10
	50	6	7	9
	60	5	6	8
Minor Thoroughfares*	20	9	12	14
	30	9	11	12
	40	9	10	12
	50	7	8	10
	60	6	7	9
	70	5	6	7
Local Streets*	20	-	11	16
	30	7	10	14
	40	7	9	12
	50	6	8	10
	60	5	6	-

b. Minimum grade should not be less than 0.5% .

c. Grades for 30 meters (100 ft) each way from intersections (measured from edge of pavement) should not exceed 5%.

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* For streets and roads with projected annual average daily traffic less than 250 or short grades less than 150 meters (500 ft) long, grades may be 2% steeper than the values in the above table.

(Reference NCDOT Metric Design Manual page 1-12 T-3)

3. Minimum Sight Distance - In the interest of public safety, no less than the minimum sight distance applicable shall be provided. Vertical curves that connect each change in grade shall be provided and calculated using the following parameters:

SIGHT DISTANCE (METRIC)					
Design Speed (km/h)	30	50	60	90	100
Stopping Sight Distance					
Minimum (meters)	29.6	57.4	74.3	131.2	157.0
Desirable (meters)	30	70	90	170	210
Minimum K* Value for:					
Crest curve	3	9	14	43	62
Sag curve	4	11	15	30	37
Passing Sight Distance:					
Minimum Passing Dist for two lanes, in m	*	*	*	*	*

(General practice calls for vertical curves to be multiples of 10 meters. Calculated lengths shall be rounded up in each case.)
* Currently under revision.
(Reference NCDOT Metric Design Manual page 1-12 T-1)

SIGHT DISTANCE (ENGLISH)				
Design Speed, MPH	30	40	50	60
Stopping Sight Distance:				
Minimum (ft.)	200	275	400	525
Desirable (ft.)	200	325	475	650
Minimum K* Value for:				
Crest Curve	30	60	110	190
Sag Curve	40	60	90	120
Passing Sight Distance:				
Minimum Passing Distance for 2 lanes, in feet	1,100	1,500	1,800	2,100

(General practice calls for vertical curves to be multiples of 50 feet. Calculated lengths shall be rounded up in each case.)
(Reference NCDOT Metric Design Manual page 1-12 T-1)

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* K is a coefficient by which the algebraic difference in grade may be multiplied to determine the length of the vertical curve which will provide the desired sight distance. Sight distance provided for stopped vehicles at intersections should be in accordance with "A Policy on Geometric Design of Highways and Streets, 1990".

4. The "Superelevation Table" shown below shows the minimum radius and the related maximum superelevation for design speeds. The maximum rate of roadway superelevation (e) for rural roads with no curb and gutter is 0.08. The maximum rate of superelevation for urban streets with curb and gutter is 0.06, with 0.04 being desirable.

SUPERELEVATION TABLE (METRIC)		
Design Speed	Maximum e*	Minimum Radius m
50 km/h	0.04	100
65	0.04	175
80	0.04	280
100	0.04	490
50	0.06	90
65	0.06	160
80	0.06	250
100	0.06	435
50	0.08	80
65	0.08	145
80	0.08	230
100	0.08	395

e = rate of roadway superelevation, meter per meter

SUPERELEVATION TABLE (ENGLISH)			
Design Speed	Maximum e*	Minimum Radius ft.	Max. Deg. of Curve
30 mph	0.04	302	19 00′
40	0.04	573	10 00′
50	0.04	955	6 00′
60	0.04	1,637	3 45′
30	0.06	273	21 00′
40	0.06	521	11 15′
50	0.06	955	6 45′
60	0.06	1,432	4 15′
30	0.08	260	22 45′
40	0.08	477	12 15′
50	0.08	819	7 30′
60	0.08	1,146	4 45′

* e = rate of roadway superelevation, foot per foot
(Reference NCDOT Metric Design Manual page 1-12 T-6 thru T-8)

D. Intersections

1. Streets shall be laid out so as to intersect as nearly as possible at right angles, and no street should intersect any other street at an angle less than sixty-five (65) degrees.

2. Property lines at intersections should be set so that the distance from the edge of pavement, of the street turnout, to the property line will be at least as great as the distance from the edge of pavement to the property line along the intersecting streets. This property line can be established as a radius or as a sight triangle. Greater offsets from the edge of pavement to the property lines will be required, if necessary, to provide sight distance for the stopped vehicle on the side street.

3. Off-set intersections are to be avoided. Intersections which cannot be aligned should be separated by a minimum length of 60 meters (200 ft) between survey center lines.

E. Cul-de-sacs

Cul-de-sacs shall not be more than 150 meters (500 ft) in length. The distance from the edge of pavement on the vehicular turn around to the right-of-way line should not be less than the distance from the edge of pavement to right-of-way line on the street approaching the turn around. Cul-de-sacs should not be used to avoid connection with an existing street or to avoid the extension of an important street.

F. Alleys

1. Alleys shall be required to serve lots used for commercial and industrial purposes except that this requirement may be waived where other definite and assured provisions are made for service access. Alleys shall not be provided in residential subdivisions unless necessitated by unusual circumstances.

2. The width of an alley shall be at least 6.0 meters (20 ft).

3. Dead end alleys shall be avoided where possible, but if unavoidable, shall be provided with adequate turn around facilities at the dead end as may be required by the Planning Board.

G. Permits For Connection To State Roads

An approved permit is required for connection to any existing state system road. This permit is required prior to any construction on the street or road. The application is

available at the office of the District Engineer of the Division of Highways.

H. Offsets To Utility Poles

Poles for overhead utilities should be located clear of roadway shoulders, preferably a minimum of at least 9.0 meters (30 ft) from the edge of pavement. On streets with curb and gutter, utility poles shall be set back a minimum distance of 1.8 meters (6 ft) from the face of curb.

I. Wheel Chair Ramps

All street curbs being constructed or reconstructed for maintenance purposes, traffic operations, repairs, correction of utilities, or altered for any reason, shall provide wheelchair ramps for the physically handicapped at intersections where both curb and gutter and sidewalks are provided and at other major points of pedestrian flow.

J. Horizontal Width on Bridge Deck

1. The clear roadway widths for new and reconstructed bridges serving 2 lane, 2 way traffic should be as follows:

a. Shoulder section approach

i. Under 800 ADT design year

Minimum 8.4 meters (28 ft) width face to face of parapets, rails, or pavement width plus 3.0 meters (10 ft), whichever is greater.

ii. 800 - 2000 ADT design year

Minimum 10.2 meters (34 ft) width face to face of parapets, rails, or pavement width plus 3.6 meters (12 ft), whichever is greater.

iii. Over 2000 ADT design year

Minimum width of 12 meters (40 ft), desirable width of 13.2 meters (44 ft) width face to face of parapets or rails.

b. Curb and gutter approach

i. Under 800 ADT design year

Minimum 7.2 meters (24 ft) face to face of curbs.

ii. Over 800 ADT design year

Width of approach pavement measured face to face of curbs.

Where curb and gutter sections are used on roadway approaches, curbs on bridges shall match the curbs on approaches in height, in width of face to face of curbs, and in crown drop. The distance from face of curb to face of parapet or rail shall be a minimum of 450 millimeters (1' 6"), or greater if sidewalks are required.

2. The clear roadway widths for new and reconstructed bridges having 4 or more lanes serving undivided two-way traffic should be as follows:

a. Shoulder section approach - Width of approach pavement plus width of usable shoulders on the approach left and right. (Shoulder width 2.4 m (8 ft) minimum, 3.0 m (10 ft) desirable.)

b. Curb and gutter approach - Width of approach pavement measured face to face of curbs.

APPENDIX C

NC 53 Bypass Supplement

Choosing the location of the NC 53 Bypass around the Town of Burgaw proved to be the most time consuming portion of this plan. Several alignments were studied before one was finally chosen. The Town of Burgaw had an adopted thoroughfare plan showing their preferred location for the bypass. A portion of this alignment fell outside the Town's Extraterritorial Jurisdiction (ETJ). Therefore, the alignment the Town chose was shown on the initial draft of the County's thoroughfare plan.

Several citizens protested the location of the bypass. The County requested that the Burgaw Town Board consider other locations for the bypass. The Town agreed, and asked for a joint public hearing with the Town Board and the County Commissioners. At this hearing, both boards voted unanimously to approve the location shown on the Pender County Thoroughfare Plan map dated June 2, 1997, and the Burgaw map with revision date May 30, 1997.

One problem with the alignment involves the residents along Burgaw Creek Loop Road. This road intersects existing NC 53 just west of I-40. This area is subject to heavy flooding from Burgaw Creek. The residents of this area were concerned that a road project in this area would cause further flooding to their homes. In the design and construction of the NC 53 Bypass, great care should be taken not to aggravate the flooding problem.

In addition, several threatened and endangered species were listed along the alignment by the Natural Heritage Program. Further research showed that the last known occurrence was before 1950. On particular species of concern was the *Lysimachia Asperulifolia* (Rough Leaf Loose Strife). This plant is considered an endangered species. However, the last observance of the plant was in 1879. For this reason, it was assumed that the placement of the bypass through this area would be acceptable.

The alignment passed through a newly acquired County park. The County was strongly in favor of having this road through the park. The road was seen as a benefit, as it provided access to the park. Even though a small portion of the land would be cut off from the rest of the park, the County felt that this would not change the park's development. In order to avoid 4(f)[1] difficulties, the County agreed to include the roadway corridor as part of the park's master plan, and send a letter expressing their support for the project, and the adopted alignment.

1. 4(f) refers to the 1966 DOT Act, Revised in Section 303, Title 49. 4(f) places restrictions on use of public parks for highway projects. In Section 4(f) Policy Paper dated September 24,1987 (revised June 7, 1989) page 18 deals with the joint development of a highway corridor and a park.

Pender County

OFFICE OF COUNTY COMMISSIONERS
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TELEPHONE (910) 259-1200 FAX (910) 259-1402

June 3, 1997

Mr. Mark Freeman
Transportation Engineer
Statewide Planning Branch
PO Box 25201
Raleigh, NC 27611

Dear Mr. Freeman:

On behalf of the Pender County Board of Commissioners, I am taking this opportunity to discuss the proposed NC 53 Bypass of Burgaw, and the alignment adopted by the Pender County Commissioners, as well as the Burgaw Town Board at our joint public hearing June 2, 1997. Specifically, I am addressing the portion of that alignment that passes through a planned park west of SR 1340 (Old Savannah Road).

If the bypass passes through the northern portion of the park, it will not affect our plans for the development of the park. In fact, Pender County would benefit from such a road, as it would provide access to our new park. We understand the potential negative aspects of having a bypass in this location, such as increased traffic (especially truck traffic). However, we feel that the benefits of this roadway exceed those negative aspects. We are jointly developing this park to reserve the NC 53 Bypass corridor.

It is the desire of my Board to move forward with this proposal. We support the NC 53 Bypass project. We also support the proposed location of the NC 53 Bypass as shown on our adopted Thoroughfare Plan map, dated June 2, 1997. Finally, we fully support the roadway passing through the northern portion of our proposed park as an integral part of the park's development.

Thank you for your assistance.

Respectfully,

John Bauer gp

John Bauer
County Manager for
Pender County Board of Commissioners

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JB/gp